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The Psychological Impact of Smartphones: The Effect of Access to One's Smartphone on Psychological Power, Risk Taking, Cheating, and Moral Orientation.

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THE PSYCHOLOGICAL IMPACT OF SMARTPHONES:
THE EFFECT OF ACCESS TO ONE'S SMARTPHONE ON PSYCHOLOGICAL POWER, RISK TAKING, CHEATING, AND MORAL ORIENTATION

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To Dylan

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ABSTRACT

Egan and Larson (2015) found that access to one's smartphone resulted in an increase in one's sense of psychological power. Psychological power is associated with a variety of behavioral outcomes, many of them moral in nature (Keltner, Gruenfeld, & Anderson, 2003). This dissertation attempted to conceptually replicate the findings obtained by Egan and Larson (2015) and to extend them by testing whether smartphone-induced power had moral implications. Specifically, Study 1 tested whether access to one's smartphone increased psychological power, and in turn risk taking and moral orientation. Study 2 tested whether access to one's smartphone increased psychological power, and in turn cheating. Further, both studies also investigated the possible moderating role played by smartphone psychological ownership (how psychologically attached an individual is to his or her smartphone). Results failed to replicate the effect of smartphone access on psychological power but did show that smartphone psychological ownership played a significant role in psychological power.

CHAPTER I

SMARTPHONES AND SOCIETY

People behave differently when they have their smartphone with them versus when they do not. Certainly, some of those behavioral differences result from distraction. Frequently throughout the day, a person's smartphone chirps, beeps, and buzzes, temporarily distracting him or her from other activities. But distraction alone fails to explain all of the behavioral changes provoked by smartphones. Certain behaviors that would have been very difficult, or even impossible, without a smartphone become much easier. Smartphone users have access to a wide variety of resources through their mobile device. They can access information, other people, and a multitude of tools. For instance, a person can explore an unfamiliar area of town confident that the GPS capabilities available through their phone will help them navigate their way back home safely. These tools, housed in this device, give their user power to accomplish tasks. However, when the device fails – is lost, broken, stolen, malfunctions, or runs out of battery – those resources are not available, and the power that they imparted is lost.

Not surprisingly then, people report feeling anxious and uncomfortable without their smartphone. In fact, clinical psychologists are studying a phenomenon referred to as *nomophobia* which is characterized by the anxiety resulting from overdependence on

one's mobile phone and the fear of being without it (Bragazzi & Del Puente, 2014; Elmore, 2014; Guthrie, 2013). Nomophobia was considered for inclusion in the most recent edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V). Ultimately, it was not included, but researchers are continuing to investigate is as a possible specific phobia for future inclusion (Bragazzi & Del Puente, 2014). As illustrated by experiences such as nomophobia, the impact of smartphones on their users can be profound. To a lesser extent though they influence their user in subtler ways that still have important implications. Of particular interest in this dissertation is that they may sometimes compel people to behave in ways that are inconsistent with social norms or even moral values.

The internet is rife with instances of people shaming others for their inappropriate smartphone use. For instance, the blog Parents on Phones (hosted on the popular social media site Tumblr[1]) is dedicated to sharing pictures of parents caught neglecting their children while using their smartphone. The intent appears to be to shame parents for this behavior presumably to discourage others from doing so also. Researchers at Boston University Medical Center took a more rigorous and systematic approach to investigating this behavior. They conducted a field study wherein observations were made of caregivers and children at a fast food restaurant. They found that parents who were the most absorbed in using their mobile phone responded the most severely to children's misbehavior (Radesky, Kistin, Zuckerman, Nitzberg, Gross, Kaplan-Sanoff, Augustyn, & Silverstein, 2014).

[1] http://parentsonphones.tumblr.com/

Both the Parents on Phones blog and findings like those obtained by Radesky et al. (2014) have contributed to a growing public discourse concerned with *mobile etiquette* and finding ways to preserve social norms that seem to be deteriorating as a result of smartphone use. For instance, recently both the Pew Research Center and Microsoft conducted studies to identify the smartphone-related behaviors that others find most inappropriate or offensive. Topping the list compiled by Microsoft, 21.48% of people reported that the behavior that irritated them the most is when people watch videos, play games, or listen to music in public spaces without using headphones. Second on the list, 20.89% of people said that it was most irritating when people converse loudly on their mobile phone in public. So, the top two most irritating mobile-phone usage behaviors were both related to noise resulting from other people using their device (Fraser, 2011).

The results obtained by Pew ironically revealed that while 82% of those surveyed reported disapproving of mobile phone use at restaurants, family dinners, meetings, movie theaters, and church/worship services, 89% admitted to having used their mobile phone at their most recent social gathering. In fact, 22% of respondents said that they either frequently (6%) or occasionally (16%) use their phone in an attempt to "Avoid interacting with others who are near you." The trend toward public and sometimes inappropriate cell phone use seems the most prevalent among younger users (ages 18 to 29) (Rainie & Zickuhr, 2015).

New rules, regulations, and even laws are being adopted to help deal with the growing problem of inappropriate mobile phone usage – signs asking patrons to refrain from using their mobile phone in the checkout line, policies banning the use of *selfie sticks* (used to take pictures of oneself with a smartphone) at amusement parks, and laws

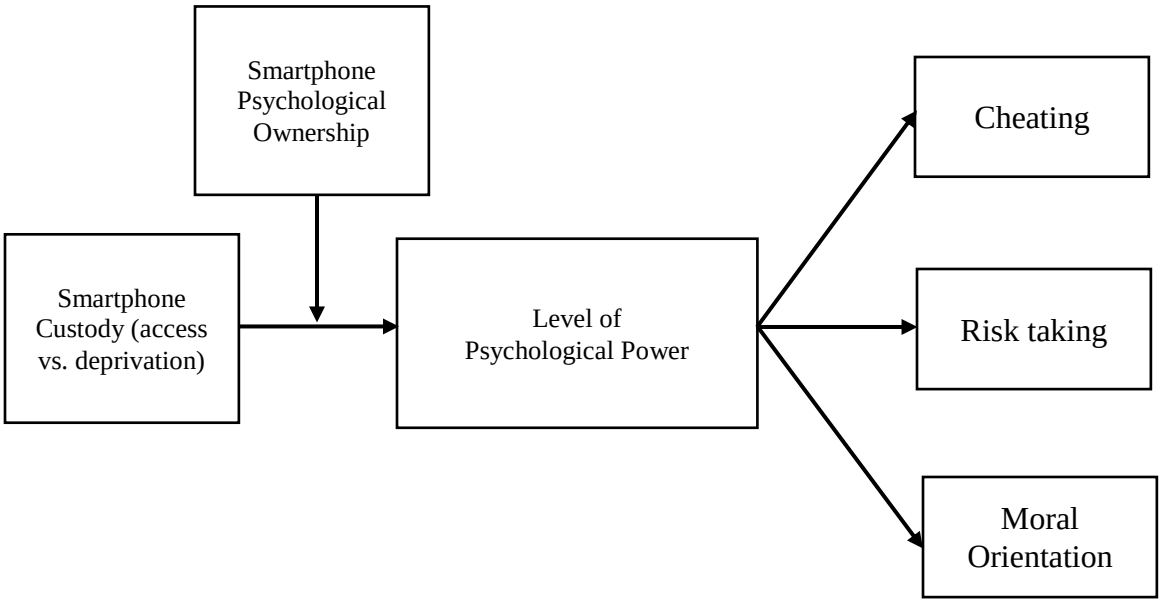
accompanied by stiff fines for texting while driving. People appear either unaware of or unable to adhere to long-standing social norms surrounding social interaction while using these devices.

From the parent neglecting her child in favor of her smartphone, the driver attending to his phone rather than to the road, the clerk too busy texting to assist the customer, to the spouse checking his phone while his wife sits across from him at the restaurant; smartphones appear to be making us poorer parents, drivers, employees, and partners. Renny Gleason (2009), game developer turned consultant, gave a TED Talk entitled *Our Antisocial Phone Tricks* wherein he took a humorous approach to the paradoxically antisocial behaviors spawned by these apparently "social" technologies. He makes a very serious point though by remarking that when we attend to our smartphone, rather than a physically present person, we are essentially telling that person, "You are less interesting than virtually anything that could come to me through this device." Gleason (2009) urged the developers attending his TED talk to design technologies that make their users better rather than worse people. I would add that the responsibility also rests at the individual level to use technologies in ways that make us better rather than worse people. However, a theoretical framework and empirical evidence are lacking to inform smartphone users just how to do to that. A first step in filling this gap is understanding the impact that these devices have on how we perceive ourselves and others.

In the following pages I explore the possibility that the apparent unwillingness or inability to successfully regulate our own smartphone use and to abide by longstanding social norms stems from the impact that these devices have on users' level of

psychological power. Specifically, I test the prediction that access to one's smartphone increases feelings of psychological power. Increased psychological power is associated with sequella such as increased risk taking (Keltner, Gruenfeld, & Anderson, 2003), a general sense that rules do not apply to oneself (Lammers, Stapel[2], & Galinsky, 2010), and at times, more immoral behavior (e.g., Lammers, et al. 2010; Lammers, Stoker, Jordan, Pollmann, & Stapel, 2011; Yap, Wazlawek, Lucas, Cuddy, & Carney, 2013). This prediction is depicted in Figure 1 below. Access to one's smartphone was expected to result in increased psychological power, which was expected to lead to more cheating, more risk taking, and a relative shift toward a deontological moral orientation.

Figure 1. Proposed moderated mediation model of the influence of smartphone custody on psychological power (moderated by smartphone psychological ownership) and in turn cheating, risk-taking, and moral orientation tested in the current dissertation.



[2] All articles wherein Diederik Stapel is listed as an author have been checked and were not among those retracted.

Over the next two chapters, relevant theoretical perspectives will be discussed along with corresponding empirical research. In Chapter 2, I will describe theory and research related to the impact of artifacts and possessions on individuals. In Chapter 3, I will review the Approach/Inhibition Theory of psychological power and relevant research. Chapters 4 and 5 respectively report on a pair of studies done including specific predictions, methodology, and results. Chapter 6 presents some supplementary analysis. Finally, Chapter 7 provides a summary of the findings along with a general discussion.

CHAPTER II

PEOPLE AND POSSESSIONS

The Psychological Impact of Smartphones

> *"Millions of items in the outward order are present to my sense which never properly enter into my experience. Why? Because they have no interest for me. My experience is what I agree to attend to. Only those items which I notice shape my mind – without selective interest experience is an utter chaos." (James, 1890, p. 402)*

The issue, as illustrated in the quote above, is that the things to which we attend should be those to which we *agree* to attend. But this often seems not to be the case in the technologically-saturated environment that we occupy. Perhaps for this reason, many have described modern life as chaotic (e.g., Carl Honoré's TED Talk *In praise of slowness*). The modern world is comprised of many relatively recent additions. More than ever, people are presented with a glut of things to which they can and sometimes must attend. Many of those things actively vie for our attention – televisions, radios, announcements, advertisements. I argue that one object, more than any other, not only vies for individuals' attention, but is extremely successful in capturing it: smartphones. They do so by bringing into the palm of our hand myriad things onto which we can focus our attention. News stories delivered in real time, photographs from friends and family streaming in throughout the day, games, and access to a seemingly unlimited supply of

music and videos – none of which we may have had access to were it not for the smartphone.

Not surprisingly then, some have attributed the behavioral changes resulting from smartphones primarily to the distraction that they introduce (e.g., Przybylski & Weinstein, 2013; Misra, Cheng, Genevie, & Yuan, 2014). As demanding as they can be however, they present their user with much more than just distraction. They also provide options and abilities that otherwise would not have existed because they house valuable resources and information. Having access to these resources and information gives a smartphone user power that they did not have without it.

Smartphones as Tools

In the most basic sense, a smartphone is a tool. Throughout history, humans have been dependent on and thus invested in their tools. "The Paleolithic hunter who spent days chipping stone tools regained the psychic energy invested fashioning them, and more, through the saving in time and the added efficiency in procuring calories that the use of the tool provided." (Rochberg-Halton & Csikszentmihalyi, 1981, p. 53). We no longer live in Paleolithic times. We no longer hunt with stone tools. Most often, our tools are technological, but we invest in them the same way. The time spent setting up e-mail rules, programming calendar events and reminders, downloading applications, upgrading software, and being active on social media are modern man's version of sharpening his tools so that when the time comes to use that tool effectively, it will be ready.

Smartphones are extremely versatile and customizable tools. They are also compact and lightweight. We do not have to expend much energy in using them or even

fashioning them. Amber Case (2010), cyborg anthropologist and founder of Geoloqi Inc., refers to smartphones as a "little Marry Poppins technology" because like Poppins' famous bag, we can add as many things to it as we like and it does not get any heavier. In fact, Case (2010) argues that with a smartphone in our hand, we are cyborgs. We are enhanced human beings as a result of the technology. According to The Merriam-Webster Dictionary, a cyborg is "a bionic human" or "a person whose body contains mechanical or electrical devices and whose abilities are greater than the abilities or normal humans." In a very real sense, these devices give their user abilities beyond what a normal human possesses. The essential thesis of this dissertation is that those super-human abilities confer a sense of power on the user, and that habitual and/or long-term use of the device results in a cumulative increase in perceptions of psychological power.

Smartphone Sources of Influence

There are three specific ways that smartphones influence their users. First, they have become the medium of the day. A large amount of communication, information consumption, media consumption, and other behaviors are accomplished through the smartphone. Second, as mentioned already, they grant access to a variety of resources. Their mere presence serves as a reminder of those resources and the capacity that users have as a result. Third, we physically use smartphones and when we do, the impact that the posture we assume causes embodiment effects. This dissertation will focus primarily on the second source on influence – the fact that smartphones grant access to resources and so are a tool that bestows power on the holder. However, because these sources of influence are interrelated and also to present a more balanced picture of how smartphones influence behavior, all three sources are discussed.

Smartphones as a medium. Smartphones as a medium do not necessarily increase or decrease power. But, as a medium, smartphones do perform mediational and even hermeneutic roles that can have profound, albeit subtle, consequences. As the medium by which their users interact with others and the outside world, smartphones can change how that user interprets the world, others, and reality by allowing us access to information and choices that we would not have had otherwise (Verbeek, 2011). McLuhan eloquently points out the power of the medium in the following quote:

> *"The medium, or process of our time – electric technology – is reshaping and restructuring patterns of social interdependence and every aspect of our personal life. It is forcing us to reconsider and reevaluate practically every thought, every action, and every institution formerly taken for granted…Societies have always been shaped more by the nature of the media by which men communicate than by the content of the communication." (McLuhan & Fiore, 1967, p. 8)*

In the early 1980's, Rochberg-Halton and Csikszentmihalyi (1981) pointed out that because the electronic technology is assumed to be neutral, few had studied the impact of using it (the television in particular, at that time) irrespective of the content accessed through it. This is the case also with smartphones. Despite users' habitual use of smartphones (e.g., Oulasvirta, Rattenbury, Ma, & Raita, 2012) research thus far has focused mainly on content. For instance, there is a fairly active literature on the effectiveness of mobile persuasive technologies, many of which are delivered as smartphone applications (e.g., Eslambolchiar, Wilson, & Komninos, 2010). But, the device, the medium, is not neutral and it is changing society, the way we interact, and our expectations of one another.

Miller-Ott and Kelley (2015) provide support for McLuhan's claim. They found that people's expectations of their romantic relationships are shifting based on the ubiquitous presence of mobile phones and the expectation of constant availability. Participants in their focus groups reported a greater expectation for undivided attention on dates and other intimate settings compared with less intimate settings, but still tolerated some phone use. Specifically, they expressed greater acceptance of their partner taking a call from someone important (like a mom or boss), and if the usage was brief and forewarned. Although they said that being on the phone was rude, they said they neither turn their phone off during dates nor expect their partner to either (Miller-Ott & Kelley, 2015). It would appear that people are adjusting their expectations to accommodate inconsiderate behavior even in intimate social settings. However, smartphone use appears to be having a negative impact on intimate relationships despite these adjusted expectations.

Roberts and David (2016) studied a behavior referred to as *Pphubbing*. This term is an abbreviation of the phrase "partner phubbing", with the word *phubbing* being derived by combining the words *phone* and *snubbing*. Thus Pphubbing refers to snubbing one's partner while using one's cell phone. In a series of two studies Roberts and David (2016) developed a valid and reliable measure of Pphubbing and found that Pphubbing led to less relationship satisfaction. The relationship was mediated by conflicts resulting over cell phone use and was moderated by attachment style, with those with anxious attachment styles experiencing more conflict and more negative outcomes from Pphubbing behavior (Roberts & David, 2016).

Smartphones as a reminder of resources. For some objects, their presence alone – whether or not it is actually used or interacted with – has psychological implications. Just having access to such an object changes the way the actors feel about or interpret a situation. Verbeek (2011) points out that when a man has access to a gun, the tool in his possession redefines him. While he possesses it, he is a potential gunman. What the man is capable of with that object changes everything about the situation. In a subtler way, this is what happens with access to a smartphone. If smartphones, similar to guns, fundamentally change how actors interpret the situation we would expect effects based on their presence alone. This is exactly what was found by Przybylski and Weinstein (2013).

Przybylski and Weinstein (2013) conducted a laboratory study wherein participants had either an important or casual conversation either in the presence of a cell phone or not. The phone did not belong to either participant and was not used; however, its presence alone negatively impacted ratings made of participant's conversation partner's trust and empathy, and also of the overall quality of the conversation. This was especially true if the topic of the conversation was important rather than casual (Przybylski & Weinstein, 2013).

Misra, et al. (2014) conceptually replicated this study in a field setting. Again, the importance of the topic was manipulated (meaningful or casual), but the presence of mobile devices was allowed to vary naturally. Trained observers noted whether either participant either held his or her mobile device or placed it on the table at which participants were seated at any point during a 10-minute conversation. When this

occurred, participants again rated their conversation partner as showing less empathic concern and the quality of the conversation as lower (Misra, et al., 2014).

Both Przybylski and Weinstein (2013) and Misra et al. (2014) explained their findings in terms of the distraction posed by the presence of a mobile phone. However, this explanation seems unlikely, especially for the study done by Przybylski and Weinstein (2013) where the phone neither belonged to nor was used by either participant. In these studies, psychological power would seem to provide a more parsimonious explanation. If the smartphone's presence reminded participants of access to valuable resources available through the smartphone, thus making them feel more psychologically powerful, the expected results would be very similar (or identical) to those observed.

Results obtained by Vohs, Mead, and Goode (2006) can similarly be interpreted as the reminder of resources influencing power. In a series of nine studies, Vohs et al. (2006) tested and found support for the hypothesis that either the mere presence or primed thoughts of money make people feel self-sufficient, and that self-sufficiency in turn produces both positive (increased motivation) and negative (increased interpersonal conflict) behaviors. In 2008, these same authors published another study conceptually replicating these findings showing that self-sufficiency caused people to work harder, but also to attend less to others' needs and also led to more interpersonal conflict (Vohs, Mead, & Goode, 2008). In both studies by Vohs et al. (2006; 2008), self-sufficiency was the explanation used.

However, money is a resource; a very flexible resource like a smartphone. Having money often means having power. Thus, the presence of money just as likely could have increased feelings of psychological power and as a result also feelings of self-

sufficiency. Increased psychological power is associated with attention to rewards, disinhibited behavior, (Keltner, et al., 2003), and a greater preference for social distance (Lammers, Galinsky, Gordjin, & Otten, 2012). Thus increased psychological power would also have resulted in the same behaviors observed by Vohs et al. (2006; 2008) (i.e., greater persistence on tasks, a preference for working alone, and increased interpersonal conflict). In fact, psychological power has empirically been linked with feelings of self-sufficiency (e.g., Lammers, et al., 2012). Similarly, if the presence of a smartphone increased feelings of psychological power in the Przybylski and Weinstein (2013) and Misra et al. (2014) studies, that also would have increased participants' preference for social distance and could have reduced the feeling of connectedness and perceived empathic concern between conversation partners.

Most relevant to this dissertation, Egan and Larson (2015) conducted a study that specifically looked at whether the mere presence of a smartphone influenced perceptions of psychological power. Using the same manipulation that will be described in Chapters 4 and 5, access to one's smartphone was experimentally manipulated and measures of psychological power, social self-efficacy, and general self-efficacy were taken. As predicted, access to one's smartphone had a significant impact on psychological power as measured in a point-taking game (i.e., the self-versus-public-goods social dilemma measure adapted from Galinsky, Gruenfeld, & Magee, 2003). Specifically, compared with those in the smartphone deprivation condition (as well as participants in both a student ID access and deprivation condition for comparison), participants with access to their smartphone took significantly more points for themselves from a pool of points shared by all participants in a group data collection session. Given their capacity to aid

users in accomplishing tasks, it seemed intuitive that access to one's smartphone might also increase perceptions of self-efficacy; however, that prediction was not supported[3] using either the measure of general or social self-efficacy (Egan & Larson, 2015).

Embodiment effects and power. There is a final means by which smartphones may influence users' sense of power. Whenever individuals use a device, that use requires physically holding or interacting with the device. The way that the device requires a user to sit or stand can result in embodiment effects; some of which result in either an increase or decrease in feelings of power. Embodiment effects refer to the various ways that feedback from the body influence the brain and cognitive processes. For instance, smiling makes people feel happier and interpret jokes as being funnier because the individual interprets the smiling behavior as information about mood or as a source of information about the target being evaluated (e.g., Schwarz, 2013). Holding an open, expansive posture makes people feel more powerful while holding a closed, constricted posture makes people feel less powerful (e.g., Bos & Cuddy, 2013; Yap, et al., 2013).

In two studies, Yap et al. (2013) studied the impact of artifacts on human behavior by looking at embodiment effects. In the first study, they arrange a workspace in which participants completed a creative task (made a collage). Depending on the arrangement of the items on the desk and the size of the mat on which to work, participants were inclined to assume a constricted or expansive posture while working. Expansive postures

[3] Limitations of the self-efficacy measures may have prevented significant differences from being observed. Specifically, both the general and social self-efficacy measures were self-report which are inherently more prone to responder bias. Also, the measure of general self-efficacy is not widely accepted in the self-efficacy literature as self-efficacy is considered to be a context dependent construct that should be measured at the level of specific goals and behaviors.

result in embodied effects of high power whereas constricted postures result in embodied effects of low power. As a result, participants who worked in the more cramped workspace were less likely to cheat on a subsequent part of the experiment than were those who worked in the less-cramped workspace.

In the second study, Yap et al. (2013) used a driving simulation to measure the effects of constricted versus expanded postures on driving behaviors; specifically traffic violations. They conceptually replicated the findings reported above, finding that those whose drivers' seats were placed lower to the ground and closer to the wheel committed fewer traffic violations than did those whose seats were up higher and further away from the steering wheel. The low, close placement of the driving seat required participants to assume a constricted posture, inducing feelings of lower power that led to more inhibited behavior (i.e., less aggressive driving and fewer traffic violations.) The higher, further placement of the driving seat allowed participants to assume a more expansive posture, inducing feelings of higher power that led to less inhibited behavior (i.e., more aggressive driving and more traffic violations.)

These two studies demonstrate the importance that objects situated in an environment have on psychological power and in turn behavior. Yap et al. (2013) point out that, "Each day, our bodies are continually stretched and contracted by our working and living environments – by the seats and levers in our cars and the furniture and work spaces in our homes and offices." (p. 2281). In addition to seats and levers, our environments are also littered with various technological devices, like computers, tablets, and mobile phones.

More directly relevant to this dissertation, Bos and Cuddy (2013) found that the size of various pieces of technology influenced feelings of psychological power. They had participants use one of four technologies during the first part of the experiment – a desktop computer, a laptop computer, a tablet, or a smartphone. After completing the first stage, participants were told to wait for the experimenter to return. The measure of power was the length of time that a participants waited before going to find the experimenter who had ostensibly failed to return when he or she said they would. Higher levels of power are associated with greater action taking and thus a greater likelihood to be assertive – in this context, going to get the tardy experimenter. It was found that device size negatively correlated with amount of time spent waiting. In other words, the larger the device the less time participants spent waiting.

The results obtained by Bos and Cuddy (2013) are consistent with the embodiment effects on power observed by Yap et al. (2013). Those using the smartphone were required to assume a small, constricted posture by the small size of the device – resulting in lower levels of psychological power and less assertive behavior. Whereas those using the desktop computer could assume a larger, more expansive posture – resulting in higher levels of psychological power and more assertive behavior (Bos & Cuddy, 2013).

Smartphone Psychological Ownership

The influence of smartphones on psychological power are not expected to be the same for everyone. People vary both in how much they use their smartphone and in the tasks for which they use their smartphone. But, smartphone users vary in a more fundamental way than just how much or for what purpose they use their device. Some

people *feel* more connected to their device. This experience is common of all possessions. We neither legally nor psychologically own all of the objects that we think of as ours to the same extent (e.g., Litwinski, 1947; Pierce, Kostova, & Dirks, 2003).

Litwinski (1947) was one of the first to formally explain this aspect of ownership. He identified three stages to acquiring an object. *Appropriation* is the simple occupation, or state of currently using a thing. I occupy a park bench and feel a sense of ownership of it while I am sitting on it. If someone came along and asked me to move because it was *their* bench, I would feel that *my* legitimate claim to the bench, having been using it first, was violated. *Possession* is the next more advanced stage of ownership; a "stage of growing providence." (Litwinski, 1947, p. 242) Just as I temporarily occupied the park bench, I temporarily occupy my apartment, but I feel a greater sense of ownership over it than over the park bench because I have a contractual right to it and pay to have exclusive, although temporary, use of it. Finally, *property* is the most "provident and the least precarious of the three." (Litwinski, 1947, p. 242) This stage includes what Litwinski (1947) considered the fundamental feature of ownership – the legitimate expectation to exclusive use of the object at will in the future. Once I acquire the deed to a house, I expect to have exclusive use of that property at all future points without interruption. This is the level of possession that people have of their smartphones. More importantly though, some people are highly connected to or invested in their smartphone whereas others are not as much. This individual difference can be thought of an individual's level of *smartphone psychological ownership (SPO).*

Pierce et al. (2003) distinguish psychological ownership from legal ownership based on three features. First, the object is vested with meaning and emotion. Second, a

relationship exists between owner and object where the owner closely associates the object with the self. Third, both cognition and affect are implicated in psychological ownership. Take for example, an outfit. The owner may know that he or she owns the pieces of clothing, but it may not represent his or her identity or be endowed with any particular meaning or emotion. However, if that outfit is a law enforcement uniform, it is inherently vested with meaning and symbolism that likely represents a core concept of the owner's identity. Thus, psychological ownership felt toward the uniform is likely to be greater than that felt toward the generic outfit.

Feelings of ownership serve an important psychological purpose. Specifically, Pierce et al. (2003) theorize that feelings of psychological ownership serve three motives: (1) efficacy and effectance, (2) self-identity, and (3) "having a place" (p. 8). In other words, our belongings can help us feel more capacious, can help us form and maintain a sense of self-identity, and can create a safe place to psychically dwell (e.g., a "home-away-from-home"). To the extent that smartphones serve these purposes they fulfill important psychological needs. People differ on how much psychological ownership they feel toward their device depending on how and for what purpose they use their phone.

Pierce et al. (2003) also suggest that feelings of psychological ownership develop toward an object by way of three, additive and complementary routes – control over the object, intimate knowledge of the object, and investing the self into the object. Those who engage in these behaviors more are likely to feel more psychological ownership over their device, and their device likely serves a more meaningful psychological purpose for

them. If so, having versus being denied access to it will likely have a greater impact for that individual.

In this chapter, I have attempted to build an argument, based both on theory and empirical evidence, for the assertion that smartphones impact users' feelings of psychological power. If that assertion is true, then one would expect that having access to a smartphone would produce effects consistent with elevated levels of psychological power, and that not having access to a smartphone (i.e., being deprived of access to it) would produce effects consistent with lowered levels of psychological power. In Chapter 3, I will provide a review both of the theory and empirical findings consistent with high and low levels of psychological power so as to illustrate what behaviors might be affected by the presence or absence of a smartphone.

CHAPTER III

PSYCHOLOGICAL POWER

Psychological power is commonly defined as "asymmetric control over valuable resources and outcomes within a specific situation and set of social relations." (Galinsky, Magee, Gruenfeld, Whitson, & Liljenquist, 2008, p. 1451) Stated otherwise, psychological power is "an individual's relative capacity to modify others' states by providing or withholding resources or administering punishments." (Keltner, et al., 2003, p. 265) Both definitions illustrate the point that psychological power is socially-dependent in that control is not just over resources, but it is control over the behaviors of others provided by the control over resources. For this reason, it is sometimes called *social power* (Galinsky, et al., 2003). A person may be powerful in one situation, depending on the others he or she is around and the resources he or she has access to in that context, but be powerless in another situation where he or she is around different people who have access to more, different, or greater resources than he or she does.

Another important distinction is that a person may legitimately possess a great deal of power as a result of the resources over which he or she has control, or a person may have a high sense of psychological power because he or she perceives themselves as having a great deal of control or influence. While these may and often do coincide, they

do not necessarily have to. A person may have access to valuable resources but not realize their value. In this case a person would possess a great amount of psychological power without having a great sense of psychological power. Alternately, a person may feel that he or she has a great deal of control or access to valuable resources but that inflated sense of psychological power may be illegitimate if the resources possessed do not actually allow the individual to influence or obtain valuable outcomes.

Theoretical Foundation

Approach/Inhibition Theory

Elevated psychological power results in an activation of the behavioral approach system (BAS) which increases an individual's focus on rewards and freedoms. On the other hand, reduced psychological power results in an activation of the behavioral inhibition system (BIS) which increases an individual's focus on threats, social constraint, and punishment. This causes high-power individuals to tend toward action while low-power individuals to tend toward inaction (Keltner, et al., 2003).

Galinsky et al. (2008) point out that it is not just that the powerful are actually subject to fewer threats than the powerless (although they are because they often hold the resources and the ability to administer rewards and punishment), it is also that they attend to fewer of the threats to which they are subject. This is because power leads to the activation of the BAS and causes people to focus on potential rewards rather than potential losses. In addition, powerful people are typically more self-focused as opposed to other-focused, so they also tend not to notice threats as much as do the powerless (Keltner, et al., 2003).

The Approach/Inhibition theory of psychological power very parsimoniously accounts for the wide variety of behavioral outcomes associated with various states of psychological power. For instance, for some time it was assumed that power corrupted individuals (e.g., Kipnis, 1972). However, more recent research found that sometimes power can cause people to behave more morally (e.g., Chen, Lee-Chai, & Bargh, 2001). This appears to be the case in two situations in particular. First, when thoughts of responsibility are primed along with thoughts of power, people tend to behave in prosocial ways. Also, those who naturally have a pro-other rather than a pro-self social value orientation tend to behave ethically when given power. In both situations, power enables actions that are a default way of behaving based either on the demands of the situation or individual differences. So rather than corrupting necessarily, power simply activates the BAS which results in taking action, both moral and immoral (Keltner, et al., 2003).

Sources of Power

In their now classic theory French, Raven, and Cartwright (1959) identified five bases of psychological power. *Reward power* refers to the ability that an individual has to administer or withhold rewards from another individual. Its counterpart is *coercive power*, which refers to the ability that an individual has to administer or withhold punishment from another individual. *Legitimate power* refers to the belief on the part of an individual that another party has a legitimate right to give direction or control their behavior in some way. This is the type of power afforded to the President of the United States. The President has legitimate power to the extent that citizens respect the Constitution and the democratic process by which he or she is elected. Thus, even if a

citizen does not endorse a given candidate, given a fair election, he or she should accept the legitimate power conferred on the new President by that process. *Referent power* arises when an individual identifies with, or feels "oneness" with another person or group. Identifying with a person or group will compel the individual to comply with the wishes of that group. Finally, *expert power* derives from specialized knowledge or expertise. Specifically, when an individual believes that another person possesses a piece of information, and trusts the other party to be truthful in delivering that information, the expert has power in that situation. Both conditions are necessary for expert power.

Conceivably, smartphones could influence any one of these bases of power. Most obviously though, they are poised to influence expert power. As anyone who has played a trivia game or solved a crossword can attest, access to a smartphone can give you a decided edge compared with someone without one. In more common, everyday settings, the information and processing capacity afforded a user by their smartphone can make a user the resident expert. The one with the smartphone can make dinner reservations using the Open Table mobile application, can quickly calculate a tip or split a dinner tab, can request a ride using mobile applications like Uber, can read movie reviews, and buy movie tickets all from his or her smartphone. Thus, in a simple social outing involving dinner and a movie, the smartphone user has a potential advantage compared with a non-user that may give him or her more power in that social setting.

Empirical Evidence

There is a robust body of literature on the effects of psychological power that seems consistently to support the Approach/Inhibition framework. A concise account of

that literature is provided here. For a more complete review of this literature, see Keltner, et al. (2003).

Biological Markers

Psychological power influences people at a very basic level. Carney, Cuddy, and Yap (2010) measured both risk-taking behavior and neuroendocrine levels after having participants hold either a high- or low-power pose for one minute. In line with previous research, participants in the high-power pose condition reported feeling more powerful, and showed more risk-taking behavior on a gambling task. Also, high-power was associated with lower cortisol levels and higher testosterone levels. Cortisol is a hormone related to the experience of stress, while testosterone is a hormone related to dominant and aggressive behavior. These effects were the same for male and female participants. Carney's et al. (2010) findings are especially important because cortisol levels are associated with negative health outcomes such as impaired immune function, high blood pressure, and memory loss.

Inoculation against Outside Influence

Some effects of elevated psychological power are positive. The definition of psychological power points out that power grants the holder both "control over and independence from others in obtaining important outcomes." (Galinsky et al., 2008, p. 1451) So, power is not just the ability to influence, but the ability to resist influenced by others. In a series of five studies, Galinsky et al. (2008) convincingly demonstrated this effect of power. They found that high power primed participants were less influenced by examples provided when completing a creative task, were more likely to voice opinions that were different from those of others, behaved in ways more consistent with their

social value orientation regardless of the reputation of the individual with whom they were interacting, and felt that they had more freedom in the choice to make counterattitudinal statements[4]. Thus, high-power individuals are more likely to behave in more individualistic or idiosyncratic ways, as they are less constrained by social norms and group influence than are their lower-power counterparts (Galinsky, et al., 2008).

Increased Assertiveness and Risk Taking

High-power individuals also tend to be more assertive, which can be either good or bad depending on the situation. For instance, they will not wait as long before taking action (Bos & Cuddy, 2013), and are more likely to take action to alter annoying stimuli in their environment (i.e., a fan blowing on participants in a cold experimental lab) (Galinsky, et al., 2003). Galinsky et al. (2003) found that high-power participants engaged in more risk-taking behavior in a Vegas-style blackjack task. High power individuals tend to take more risks, in part, because they are more optimistic when anticipating the outcome of those behaviors (e.g., sexual activity, information sharing) (Anderson & Galinsky, 2006).

Antisocial and Prosocial Behavior

In part, because of the disinhibiting effects and the reduced conformity to social norms, elevated power can increase socially inappropriate behavior (Keltner, et al., 2003); which can ironically lead to a decrease in power due to negative outcomes resulting from others' disapproval of the atypical behavior (Anderson & Galinsky, 2006). Keltner et al. (2003) cite several studies wherein evidence was found that high-power is

[4] This last effect resulted in more cognitive dissonance among high-power primed participants.

associated with more rude and less prosocial behavior. For instance, Brown and Levison (1987) found that elevated power lead to an increase likelihood of violating social norms surrounding politeness in communication. Similarly, Ward and Keltner (1998) provided groups of three participants with a plate of five cookies to share. Thus, each of the three participants could comfortably take a cookie, and one could comfortably take a second cookie while still leaving a cookie on the plate. Not surprisingly, the high-power primed participant was more likely to take a second cookie, leaving the other two participants in the uncomfortable spot of wanting, but not feeling comfortable taking the last cookie (Ward & Keltner, 1998).

Some of the antisocial behaviors associated with high-power may be the result of high-power individuals' preference for more social distance between themselves and others. Lammers et al. (2012) found that the relationship between power and social distance was mediated by feelings of self-sufficiency and moderated by how legitimate a person's claim to power was. So, if high-power people feel more self-sufficient, and feel less like they may depend on others either at present or in the future, they may be more willing to treat them in antisocial ways. This is consistent with activation of the BAS that causes an increase in the focus on one's own goals and rewards to the exclusion of considering the consequences for others.

Cheating. Lammers et al. (2011) found that those who occupied higher-power roles within organizations were more likely not only to report greater intentions to engage in sexual infidelity, but also reported more actual infidelity. This was true both of male and female participants in a sample of 1,561 professionals. Yap et al. (2013) manipulated psychological power by having participants hold either a high or low power pose. When

administering compensation, the experimenters intentionally overpaid participants by four dollars. Those who had held the low power pose were more likely to behave ethically by reporting the overpayment while those who had held the high power pose were more likely to steal the money by failing to report the overpayment. Similarly, Lammers et al. (2010) manipulated power using a writing prompt and then gave participants an opportunity to cheat in order to receive more raffle entries. Participants were asked to roll two ten-sided die and to report each number rolled in order to determine the number of entries earned. High power participants were more likely than low power participants to cheat by over reporting the number of raffle entries earned. Thus using three different ways of either assessing or manipulating power (organizational status, power posing, and writing prompt), and three different measures of cheating behavior (sexual infidelity, stealing money, lying/cheating to receive more raffle entries) these studies consistently find that people with power tend to cheat more.

Moral judgments. Power also fundamentally influences moral decision making and judgment. Lammers and Stapel (2009) found that high-power individuals were more inclined to endorse moral decisions founded on deontological (rule-based) arguments whereas low-power individuals were more inclined to endorse moral decisions founded on consequentialist (outcome-based) arguments. However, when rule-based outcomes did not result in a preferential outcome for the high-power individual they were inclined to make exceptions to the rule in favor of their own self-interest.

Similarly, a study by Lammers et al. (2010) found that high-power individuals were more likely to condemn other people for their cheating, while they themselves engaged in more cheating behavior. They also found that high-power individuals were

less strict in judging their own transgressions than they were in judging other people's transgressions. This effect though was reversed when the source of the power was illegitimate. Those with illegitimate claims to power were actually stricter in judging themselves than they were in judging other people. The authors refer to this phenomenon as *hypercrisy*; a term they derived from the Greek prefix *hyper-* meaning "too much" and the root *kritein* that means "being critical." (Lammers, et al., 2010, p. 742).

General Predictions

In Chapter 2, I provided a theoretical rationale for the reason that smartphones influence feelings of psychological power along with empirical evidence that would appear to provide preliminary support for that claim. In Chapter 3, I reviewed relevant literature on psychological power. If access to one's smartphone does increase feelings of psychological power, then it is expected that that access to one's smartphone will result in the same behavioral outcomes associated with elevated levels of power acquired otherwise. The current study aimed to conceptually replicate the findings obtained by Egan and Larson (2015) and also to extend them by demonstrating that these results extend to other behaviors influenced by psychological power, namely those implicated in moral decision making and behavior.

CHAPTER IV

STUDY 1

The central hypothesis of this study is that a) access to one's smartphone influences feelings of psychological power such that people feel more powerful with than without their device, and that b) smartphone-induced power produces predictable, moral behaviors consistent with states of elevated psychological power that either occur naturally or are experimentally manipulated in more traditional ways like role assignment, writing prompts, or power posing. A pair of studies that experimentally manipulate access to or deprivation from one's smartphone were conducted to test this hypothesis. In this chapter I report on the first of those two studies.

Study 1 specifically investigated whether having access to versus being deprived of access to one's smartphone influenced psychological power, moral orientation, and risk taking. Previous research has found that high power is associated with deontological moral reasoning while low power is associated with consequentialist moral reasoning (Lammers & Stapel, 2009). In the current study, it was predicted that those allowed access to their smartphone would feel a greater sense of psychological power compared with those deprived of access to their smartphone; thus it was also predicted that participants in the smartphone access condition would show a relative preference for

moral decisions based on rule-based arguments compared with participants in the smartphone deprivation condition.

High levels of psychological power are also associated with activation of the BAS, which causes people to focus on possible gains/rewards and have a greater willingness to take risks, whereas low levels of power are associated with activation of the BIS which causes people to focus on possible loss/punishment and be less willingness to take risks (Carney, et al., 2010; Keltner, et al., 2003). Because it was also predicted that access to one's smartphone would increase feelings of psychological power, it was predicted that participants in the smartphone access condition would be more likely to take risks compared with those in the smartphone deprivation condition.

In this study, the object (smartphone or student ID) to which one is allowed or deprived access is also manipulated for comparison. No differences were predicted based on object. The student ID conditions (access and deprivation) served as a control to rule out the possibility that simply being allowed access versus being deprived of access to a personal belonging influenced feelings of power. Justification for the choice of this comparison object is provided below.

Based on the theory of psychological ownership (Pierce et al., 2003), it was anticipated that the effect of smartphone access versus deprivation would not be the same for those who possessed stronger feelings of psychological ownership over their smartphone compared with those who possessed weaker feelings of psychological ownership over their smartphone. The theory predicts that being deprived of an object toward which an individual possesses strong feelings of psychological ownership could result in negative affective states and may have behavioral implications.

Furthermore, Pierce et al. (2003) argue that it may not simply be the level of psychological ownership of an object that matters, but also the routes by which those feelings develop and the motives they serve. Therefore, the relationship between smartphone psychological ownership (SPO) and power may not be a simple matter or higher or lower levels of SPO. The relationship may be different, for instance, for those using their smartphone primarily for efficacy/effectance motives compared with those using their device for self-identity motives. Thus, at a minimum, strength of feelings of psychological ownership toward one's smartphone was predicted to moderate the effect of smartphone custody on psychological power, which may then also moderate the effect of smartphone custody on risk taking and moral orientation. However, it was also thought that a more nuanced relationship may exist between SPO and power. Thus, that possibility was explored by investigating how various subscales of the measure of SPO related to power, and a corresponding research question has been added to the hypotheses (below). Based on the arguments provided, the following specific predictions are made:

- Hypothesis 1: A significant object-by-custody interaction is predicted such that compared with those in the smartphone deprivation condition, those in the smartphone access condition will exhibit more psychological power as measured using the BIS/BAS scales. No such difference is expected in the student ID condition.
- Hypothesis 2: A significant object-by-custody interaction is predicted such that compared with those in the smartphone deprivation condition, those in the smartphone access condition will exhibit more risk-taking behavior as measured

by the gambling task. No such difference is expected in the student ID condition.

- Hypothesis 3: A significant object-by-custody interaction is predicted such that compared with participants in the smartphone deprivation condition, participants in the smartphone access condition will report a stronger preference for moral decision making based on deontological/rule-based arguments. No such difference is expected in the student ID condition.
- Hypothesis 4: Psychological power will partially mediate the effect of smartphone custody on risk taking.
- Hypothesis 5: Psychological power will partially mediate the effect of smartphone custody on moral orientation.
- Hypothesis 6: Smartphone psychological ownership will moderate the effect of smartphone custody on psychological power such that those with higher levels of smartphone psychological ownership will be more affected by the custody manipulation, and those with lower levels of smartphone psychological ownership will be less effected by the custody manipulation.
- Research Questions: Does the relationship between smartphone psychological ownership and psychological power differ depending on the route by which those feelings developed or the motives served by those feelings?[5]

[5] This question will not be addressed in the current chapter, but will be given detailed attention in Chapter 6.

Method

Design and Participants

The study employed a 2 (custody: access vs. deprivation) by 2 (object: smartphone vs. student ID) by 2 (moral outcome: accept vs. reject) by 2 (order: moral orientation first vs. risk taking first) between-subjects design. Psychological power was measured using the BIS/BAS Scales (Carver & White, 1994), which will be described more fully below. Moral orientation refers to whether a person prefers a deontological/rule-based approach to moral reasoning or a consequentialist/outcome-based approach to moral reasoning, and was measured using a vignette with a follow-up question as was done in Lammers and Stapel (2009). Risk taking was operationalized as the choice to gamble (or not) with some or all of one's monetary compensation from the study.

The design resulted in 16 conditions. No differences were predicted based on order. The order in which the measures of moral orientation and risk taking occurred were counterbalanced to address the possibility that the temporal distance between the custody manipulation and dependent measures had an impact. It was thought that the effect of smartphone custody might possibly wear off and that results would be weaker for measures taken further temporally from the custody manipulation. On the other hand, Kamenetz (2015) reported that the longer individuals are unable to check their smartphone the more anxiousness they experience. Thus, the effect may have strengthened over time. Counterbalancing was used to control the effect of either possibility.

No differences were predicted based on moral outcome. Both outcomes can be supported using either rule-based or outcome-based logic. This factor was included in the study, as it was by Lammers and Stapel (2009), to test whether the predicted effects occur regardless of moral outcome. This factor was also collapsed for main analysis after preliminary analysis revealed that there were no significant effects due to moral outcome. Thus, the design as analyzed was a 2 (object: smartphone vs. student ID) x 2 (custody: access vs. deprivation) factorial design. The following discussion focuses only on those four conditions resulting from the custody and object factors.

Data was collected from 158 undergraduate students enrolled in introductory psychology courses (PSYC100, PSYC101, and PSYC304) at Loyola University Chicago. They were recruited using the Sona Systems participant management software (PSYC100 and PSYC101) and email (PSYC304). Recruitment material indicated that participants needed to be fluent English speakers who currently owned and used a smartphone. They either received two experimental credits toward a course requirement (PSYC100/101) or extra credit (PSYC304) for their participation. In addition, they were compensated between $0 and $6.00 depending on a series of choices that they made during the experiment.

Procedure

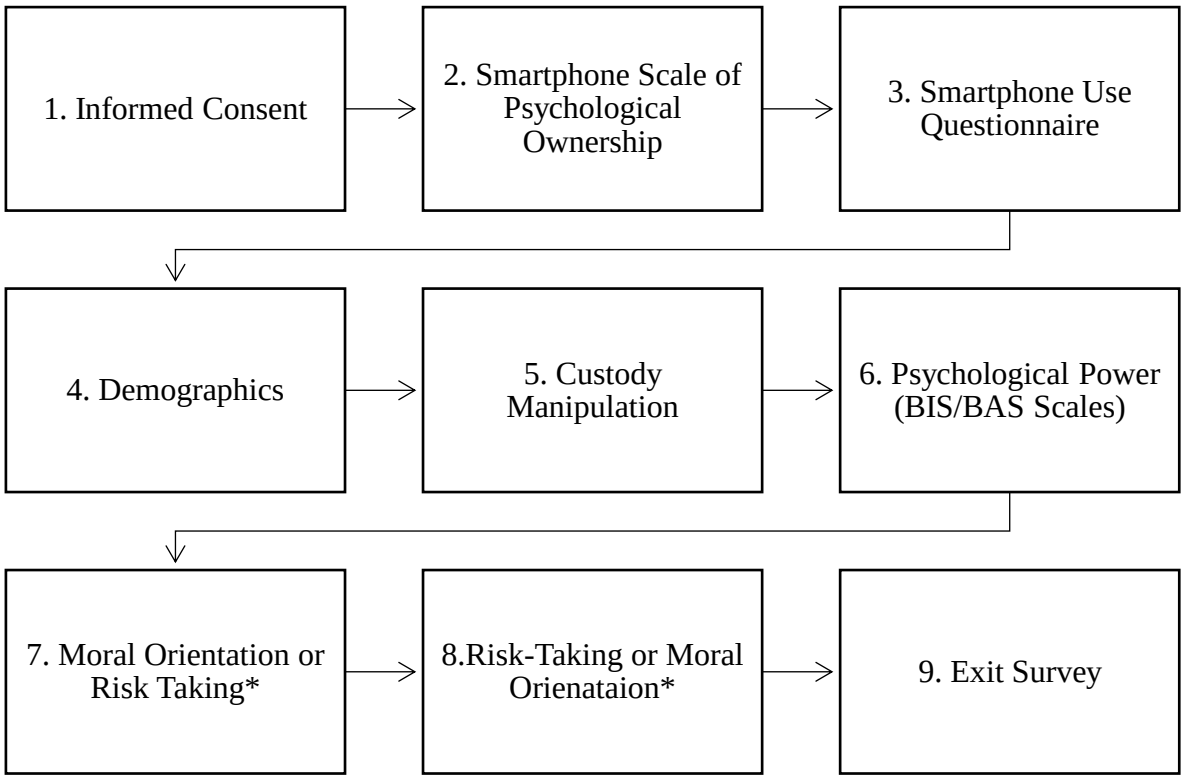
Data collections was conducted in a laboratory setting with small groups of participants taking part simultaneously. The decision to collect data in a group setting was made because psychological power is a socially dependent construct (Keltner, et al., 2003), thus it is necessary either to prime the thought of others or to collect data with others present.

Assignment to both an object condition (smartphone vs. student ID) and an order condition (moral orientation first vs. risk taking first) was decided based on session date. Both the object and order condition to be run during a given session were either randomly decided or run based on cell sizes (i.e., the session needed to maintain an even number of observations per cell was run). Thus, participants blindly self-selected an object and order condition based on the date of the session that they select.

Upon arrival at the experiment, participants were randomly assigned to one of the custody conditions (access vs. deprivation) and one of the moral outcome conditions (accept vs. reject). This was accomplished through randomized distribution of paper-and-pencil material packets. Packet order was randomized ahead of time.

See Figure 2 (below) for a diagram of the order of data collection.

Figure 2. Order of procedures used during Study 1. *Note that steps seven and eight are counterbalanced. Depending on order condition, participants either completed the moral orientation measure first and then the risk-taking measure or the risk-taking measure first and then the moral orientation measure.



Order of procedures was determined by the paper-and-pencil participant material packet. Experimenters followed a script to walk participants through the session section-by-section at the pace. Verbal and written instructions accompanied each section.

First, participants received an informed consent document. Written consent was collected from each participant. Second, participants completed the measure of smartphone psychological ownership (SPO). Third, they completed the smartphone use questionnaire. Forth, they provided demographic information (both basic and smartphone). Fifth, the custody manipulation was introduced. Participants were told either that "During the next part of the experiment, you will be asked for a piece of

information that you will be [*required to obtain* (access condition)]/[*tempted to obtain, but not permitted to obtain* (deprivation condition)] from your [*smartphone*]/[*student ID*]." Based on condition assignment, they were asked either to put their smartphone/student ID on the desk in front of them (access condition), or to place it in a clear container, which was then placed on the experimenter's desk (deprivation condition).

Next began the collection of the primary dependent measures. After the custody manipulation, participants completed the measure of psychological power. In the moral orientation first order condition, participants completed the moral orientation decision-making task (Lammers & Stapel, 2009) followed by the risk-taking measure. Alternately, participants in the risk taking first order condition completed the risk-taking measure next followed by the moral orientation decision-making task. All participants within a session complete the measures in the same order. This was done to simplify the instructions and reduce the potential for confusion and participant error. Finally, participants completed a mood measure, were probed for suspicion, were allowed to retrieve their personal belonging if applicable (i.e., smartphone or student ID), were partially debriefed, and thanked. At the very end, after the data collection material packets had been collected. Participants who had opted not to wager any of their compensation were paid first ($3.00). Next, those who had decided to wager completed a double-or-nothing game (described in detail below) and were compensated accordingly. All compensation was paid out in cash at the end of the session.

Materials

A complete set of materials used in Study 1 can be found in Appendix A. It contains a full copy of the paper-and-pencil participant material packet used. The version provided is the smartphone deprivation, moral orientation first version. Other versions vary only slightly from the provided version. Variations are described in detail in the following section.

Manipulated predictors. There were four manipulated predictors: custody (access vs. deprivation), object (smartphone vs. student ID), moral outcome (accept vs. reject), and order (moral orientation first vs. risk taking first). Recall that no predictions were made based on either moral outcome or order and that these factors were collapsed for main analyses. The two student ID conditions (i.e., student ID access and student ID deprivation) served as control conditions to rule out the possibility that simply being allowed access to versus deprived of access to a personal belonging influenced feelings of psychological power. Thus, the two experimental conditions of primary interest were the smartphone access and smartphone deprivation conditions.

Smartphones were expected to influence psychological power in ways that other personal belongings do not, in part because they make accessible knowledge and resources (e.g., utilities, activities, social networks) that are not available otherwise. Student ID was chosen as the specific control object because it possesses some of the same qualities as does a smartphone: it is used frequently and exclusively by the owner, it provides access to areas on campus including the library and dormitories, it can be used to pay for items and check out books, it is personalized with the picture, name, and student identification number unique to that individual. Thus, it has multiple functions

that are not served by another belonging, and that allow its user access to areas and items not available without it.

Measured predictor. There was one measured predictor – SPO. SPO was measured using an 18-item scale where higher numbers indicating stronger feelings of SPO. This measure was used in a previous study where it produced good reliability (α = .85) (Egan & Larson, 2015). This scale was developed based on the three routes by which feelings of psychological ownership toward an object develop (i.e., controlling the object, knowing the object intimately, and investing the self into the object) and the three motives served by psychological ownership (i.e., self-efficacy/effectance, self-identity, and having a place) suggested by Pierce et al. (2003). Specifically, 3 items were written for each route and each motive, resulting in 18 items. This measure is discussed in greater detail in Chapter 6 where the results of factor analysis are discussed.

Smartphone use questionnaire. Participants also completed a 13-item measure indicating how much they use their smartphone for various activities (e.g., sending/receiving text messages, listening to music, playing games). This item was included both to provide support for the cover story that the purpose of the study was to better understand how college students use their smartphones, and to help validate the measure SPO. The theory of psychological ownership (Pierce, et al., 2003) predicts a significant positive correlation between how much an object is used and how much psychological ownership is felt toward that object.

Psychological power. Currently, there is not a standard, direct way to measure psychological power. Within the field, it is typical to measure power by measuring its effects either on perception or behavior. For instance, Bos and Cuddy (2013)

operationalized power as the amount of time that a participant waited for an experimenter that was ostensibly tardy. Galinsky et al. (2003) measured power as action taking in the form of either averting or turning off a fan blowing on participants in an already cold room. Galinsky et al. (2003) and Egan and Larson (2015) measured power as the number of points taken for oneself in a shared resource dilemma. Ward and Keltner (1998) measured power by observing how many cookies each participant in an interacting group took.

There are also self-report measures of psychological power. The Personal Sense of Power Scale developed by Anderson, Oliver, and Keltner (2012) is a somewhat transparent self-report measure that asks relatively directly about the amount of influence that one feels that he or she has in various settings. The BIS/BAS Scales developed by Carver and White (1994) share a theoretical framework with the Approach/Inhibition theory of psychological power (Keltner, et al., 2003) that is used as a basis for the predictions tested in this dissertation. Approach/Inhibition theory posits that high-power is associated with an activation of the Behavioral Approach System (BAS) whereas low power is associated with an activation of the Behavioral Inhibition System (BIS). The BIS/BAS Scales were designed to measure levels of BIS and BAS activation. As such, they were thought to be well-suited to serve as a measure of psychological power, and were used in the current study.

The BIS scale is made up of seven items. It is designed to measure "reactions to the anticipation of punishment" (p. 322, Carver & White, 1994). The BAS scale is made up of three subscales: Drive, Fun Seeking, and Reward Responsiveness. The Drive subscale includes four items designed to measure "the persistent pursuit of desired

goals." (Carver & White, 1994, p. 322). The Fun Seeking subscale includes four items designed to measure "a desire for new rewards and a willingness to approach a potentially rewarding events on the spur of the moment" (Carver & White, 1994, p. 322). And the Reward Responsiveness subscale includes five items designed to measure "positive responses to the occurrence or anticipation of reward." (Carver & White, 1994, p. 322)

The four subscales were created based on factor analysis of data from a sample of 732 college students. Carver and White (1994) administered the BIS/BAS Scales along with measures of related constructs[6]. The BIS/BAS Scales were found to reliably correlate in the predicted direction with those existing measures. Also, initial reliability analysis yielded acceptable reliability for the BIS ($\alpha = .74$), the BAS Reward Responsiveness subscale ($\alpha = .73$), and the BAS Drive subscale ($\alpha = .76$). Reliability was just below acceptable for the BAS Fun Seeking subscale ($\alpha = .66$). Heubeck, Wilkinson, and Cologon (1998) largely replicated the validity and reliability testing done by Carver and White (1994). Furthermore, the BIS/BAS Scales were used in previous research where significant effects of power were observed on the BAS scales, but not on the BIS scale (Smith & Bargh, 2008). This is consistent with other work in the field that has more often observed effects among participants primed with high-power than among those primed with low-power regardless of the measure of power used. As Smith and

[6] The Manifest Anxiety Scale (MAS), Extraversion, Minnesota Multiphasic Personality Inventory Hypomania subscale, California Psychological Inventory Socialization scale, Life Orientation Test optimism scale, Positive and Negative Affect Schedule negativity affectivity and positive affectivity, General Temperament Survey negative temperament, positive temperament, and disinhibition-constraint scales, Susceptibility to Punishment, MacAndrews & Steele BIS scale, and the Tridimensional Personality Questionnaire harm avoidance, novelty seeking, and reward dependence scales.

Bargh (2008) said, “Power appears to transform those who possess it, rather than those who lack it.” (p. 18)

All of the BIS/BAS subscale items employ a one (*strongly disagree*) to four (*strongly agree*) response scale. The original scales were written such that higher numbers indicated less of the corresponding construct; however, as was done by Smith and Bargh (2008), in the current study the scales were anchored such that higher numbers indicate more of the corresponding construct.

Moral orientation. The measure of moral orientation used was a very slight adaptation[7] of the one used by Lammers and Stapel (2009)[8]. In this moral reasoning task, participants read about a high school girl, Carol, who is faced with the decision either to keep a promise to an old friend or to show kindness to a new girl at school by accepting her invitation to go to the theater together. There are two outcomes. In the “accept scenario”, Carol accepts the invitation from the new girl and breaks her promise to her old friend. In the “reject scenario”, Carol rejects the invitation from the new girl and keeps her promise to her old friend. For either outcome, there is both a rule-based rationale (accept: “It is generally a good rule to welcome in and be friendly to new people.”; reject: “It is generally a good rule for people to keep their promises.”) and an outcome-based rationale (accept: “Tina needs new friends at her new school, because otherwise she will feel lonely and left out.”; reject: “Corinne needs someone to help her with her problem.”) to support that decision. Participants were asked, given the outcome

[7] Minor changes were made to wording for clarity. The original version can be found in Appendix B for comparison.
[8] Used in Study 1 of that article. Adapted from Doneberg and Hoffman (1988).

to which they were randomly assigned, which is the best argument in favor of that decision. The rationale endorsed by the participant served as the measure of deontological or consequentialist moral orientation. The response scale ranged from one to nine where lower numbers indicated endorsement of the outcome-based argument and higher numbers indicated endorsement of the rule-based argument.

Risk taking. Risk taking was operationalized by having participants decide whether or not to gamble with their monetary compensation, and if so, how much to gamble. The task was described to participants as a "Double-or-Nothing Game" wherein participants: 1) decided whether or not to play, 2) decided how much (if any) money to wager, and 3) decided whether an odd or an even roll of a die would constitute a winning outcome [see Appendix C for a copy of the experimenter's script used to explain the Double-or-Nothing task]. Each participant was compensated $3.00. During the experiment, participants decided whether or not to gamble with their compensation for a chance to double it. If they chose not to gamble, they were paid $3.00 for their participation. If they chose to gamble, they made two additional choices. First, they decided how much of their compensation they wanted to gamble (in $0.25 increments from $0.25 to $3.00). Second, they decided whether they wanted the winning outcome of the roll of the die to be an even number or an odd number. After they had recorded their choices, they removed that page from the packet of experimental material, folded it in half, and passed it to the experimenter. At the very end of the experiment, participants were called to the experimenter's desk one at a time. Those who chose not to gamble were paid, retrieved their personal belonging (if applicable), and were dismissed. Those who chose to gamble rolled a fair, six-sided die. Depending on the winning outcome that

they selected (evens or odds) and their roll of the die (the number on which the die landed), the experimenter paid them an amount between $0.00 and $6.00 depending on the amount gambled. They then retrieved their personal item (if applicable) and were dismissed.

Demographics. Several pieces of demographic information were obtained from each participant including self-reported gender (multiple choice) and age (open-ended). Additionally, several pieces of information were collected to better understand participants' status as a smartphone user. Specifically, they were asked the make and model of their smartphone, at what age they first got a smartphone, how long they have had their current device, how satisfied they are with their current device, and how well their current device functions.

Exit survey. On the final page of the participant material packet, participants completed an exit survey wherein they were asked about their current affective state as influenced by the experiment as well as asked to guess the nature of the hypothesis being tested. The mood measure was included to rule out mood effects as an explanation. Participants were asked the extent to which they felt each of six emotions as a result of the study. Three items were positively valenced (happy, excited, and peaceful), and three were negatively valenced (angry, sad, and anxious). Both positive moods and increased risk taking are associated with elevated power whereas negative moods and less risk taking are associated with decreased power (Keltner, et al., 2003). Thus, it was anticipated that a correlation might exist between mood and risk taking; however, previous research using the same object and custody manipulations as were employed here did not find mood effects (Egan & Larson, 2015) nor were they expected to in the

current study. Also, because Kamenetz (2015) suggests that being deprived of access to one's smartphone may be anxiety inducing, anxiety was included as one of the items on the mood measure. However, I did not observe higher self-reported anxiety in the smartphone deprivation condition.

The hypothesis guess item asked participants, "If you had to guess, what would you say that the purpose of this study was?" Because the access and deprivation conditions were run concurrently, it was important to assess whether participants 1) accurately identified their custody condition, and 2) made any connection between the custody manipulation and the various dependent measures. Hypothesis guesses were coded as either not close, close, or accurate. Not close indicated that the guess was general and in line with the cover story that the study was to better understand how college students use their smartphone. A guess was considered "close" if the participant either mentioned the custody manipulation or mentioned one of the dependent measures (power, risk taking, or moral decision making). A guess was considered "accurate" if the participant both mentioned the custody manipulation and one of the dependent measures. The majority of guesses were not close (62.2%). Only eight guesses were coded as accurate (5.1%). See Table 1 (below) for a breakdown of hypothesis guess accuracy by condition. Guess accuracy was not particularly high in any one condition suggesting that the true nature of the study was not especially transparent in one condition in particular.

Table 1. Accuracy of hypothesis guess by condition.

		Object	
Custody	**Guess Accuracy**	**Smartphone**	**Student ID**
Access	*Not Close*	22	24
	Close	13	12
	Accurate	3	2
Deprivation	*Not Close*	25	26
	Close	16	10
	Accurate	1	2

One additional item was included in the exit survey. This item asked participants either to "try to recall" (deprivation condition) or "check and report" (access condition) either what type of shirt they were wearing in their student ID photo (student ID condition) or how many mobile applications they currently have installed on their smartphone (smartphone condition). This same item was used in Egan and Larson (2015). The item was included to provide some rationale for the custody manipulation.

Debriefing. Debriefing was accomplished in an email[9] sent to all participants at the end of data collection. The text used in the debriefing email can be found in Appendix D. Participants were made aware of the true nature of the study, told specific hypotheses, and provided with references for journal articles to read if interested.

Results

All data was collected during the Spring 2016 semester. After removing two participants that had been run in solo sessions[10] and one outlier[11], a total of 155 undergraduates (Male = 48, Female = 107) took part in Study 1. Participants were typical

[9] Participant names and email addresses were not collected as a part of the study; however, the Sona-System allows experimenters to email participants, which is how debriefing emails were delivered.
[10] Attempts were made to always ensure at least two participants, but on two occasions as the result of "no-shows" solo sessions were unavoidable.
[11] Discussed below.

college age (*M* = 19.16, *SD* = 1.03), and reported having gotten their first smartphone when they were about 14 (*M* = 14.62, *SD* = 1.92), meaning that on average participants had owned/used a smartphone for about 4.5 years (*M* = 4.55, *SD* = 2.02)[12]. The majority reported having an Apple iPhone (83.9%). Participants reported having had their current device on average for almost a year (*M* = 11.50, *SD* = 9.37)[13]. They also reported that their current device worked well (*M* = 8.43, *SD* = 1.49) and that they were satisfied with it (*M* = 8.57, *SD* = 1.55)[14].

Sessions ranged in size from 2 to 15 participants (*M* = 7.25, *SD* = 3.55). The most common session size was eight participants (20.6%). Cell sizes were kept fairly balanced. Table 2 (below) lists the number of observations made per condition.

Table 2. Number of observations per condition with all 16 conditions.

Custody	Order	Moral Outcome	Object	
			Student ID	Smartphone
Access	Risk-Taking First	Accept	8	11
		Reject	9	8
	Moral Orientation First	Accept	10	9
		Reject	10	10
Deprivation	Risk-Taking First	Accept	8	10
		Reject	11	11
	Moral Orientation First	Accept	10	9
		Reject	10	11

Ultimately, no differences were found as a result of moral outcome, and this condition was collapsed resulting in eight conditions. While a significant difference was observed based on order[15], because (a) this factor was nearly balanced on the other

[12] Demographics are without outlier in the sample.
[13] One participant reported having had her current device for 156 months (13 years) which was far longer than she reported having been a smartphone owner (3 years). Thus, it seems that she either misunderstood the question or miscalculated the number of months she had owned her current device. Thus, her response on that item only was removed and treated as missing data (was not replaced).
[14] Both on a 10-point scale where higher numbers indicate greater functionality/satisfaction.
[15] Discussed in detail below.

conditions of interest and (b) the significant difference was not of theoretical interest order was also collapsed leaving four conditions in the final design. Cell sizes were adequate and balanced in the eight resulting conditions (see Table 3 below).

Table 3. Number of observations per condition after moral outcome and order were collapsed.

Custody	Object	
	Student ID	Smartphone
Access	37	38
Deprivation	39	41

Preliminary Analysis

Missing data. For each scale or variable, the percent of missing data is reported and then the method for dealing with the missing data points is explained.

For the scale of SPO, there were 155 participants and 18 items on the scale resulting in 2,790 data points. Of those, only four were missing (0.14%). Each missing value was from a different participant and each was from a different scale item. Thus, missing values appear to be completely at random rather than systematic. Missing values were replaced by the average of the item average and the participant's average for the rest of the items on the scale of SPO.

There were no missing values on the measure of smartphone use. There was one missing value for smartphone make/model. The participant wrote in that he or she did not know the make/model of his or her device. That data point was left missing. There were no missing data for the remainder of the smartphone demographics (age at which participant first got a smartphone, how many months the current device had been owned, how well the current device functioned and how satisfied participants were with it). All participants also reported their age and gender.

The BAS measure is divided into three subscales (Drive, Reward Responsiveness, and Fun Seeking). For the Drive subscale, there were 4 items (for each of the 155 participants) resulting in 632 data points. Four values were missing (0.63%). All four missing values were on the fourth Drive subscale item[16] that appeared as the first item on the BIS/BAS questionnaire. Thus, the missing values may not be completely at random; however, due to the very low percentage of missing values it was decided that it was appropriate to replace the values. Thus, the same imputation was used to replace these missing values as was described above (using the average of the item mean and participant's subscale mean).

No missing values were observed on the Reward Responsiveness or the Fun Seeking subscale of the BAS or on the BIS subscale. No missing values were observed on the item measuring moral orientation or on any of the items associated with the mood check.

Thus of the 10,385 data points checked, only 9 were missing (0.09%) and 8 of the 9 were replaced.

Reliability, validity, and variable creation. For each of the scales discussed below, where applicable, missing values were replaced before internal consistency reliability was obtained.

Smartphone psychological ownership. After reverse scoring items 5 and 9, Cronbach's alpha for all 18 items measuring SPO was acceptable ($\alpha = .89$). By removing

[16] This item asked participants the extent to which they agreed with the statement, "When I go after something, I use a 'no holds barred' approach." It is possible that some participants were not familiar with this figure of speech, especially if they were not native English speakers, and did not respond for that reason.

reverse scored item number 5, alpha could be increase to .90, but as this is a very small improvement to an already reliable scale and to ensure that the measures used in Study 1 and Study 2 are the same, all 18 items were included in the average of SPO (M = 4.05, SD = 0.84).

Theoretically, this measure may be expected to positively correlate with average use, smartphone tenure (how long an individual has been a smartphone owner/user), how many months they have owned their current device, how well their device functions and how satisfied they are with their current device. To estimate the validity of this measure, correlations were checked between the above mentioned variables and SPO. As anticipated, positive correlations were observed among SPO and average use (r = .55, p = .00), smartphone tenure (r = .21, p = .01), functionality (r = .18, p = .03), and satisfaction (r = .24, p = .00). Thus, those who use their device more, have been a smartphone user longer, report that they are more satisfied with their device, and that it functions well also tended to report higher levels of SPO. No correlation was observed between average SPO and months having owned one's current device (r = -.09, p = .26). Interestingly, average smartphone use only correlates with smartphone tenure (r = .23, p = .01) but none of the other variables tested suggesting that the measure of SPO, while related to use, is distinct from average use. Together the acceptable internal consistency reliability and theoretically consistent correlations suggest that the measure of SPO is both reliable and valid.

Smartphone use. Cronbach's alpha obtained for the 13-item measure of smartphone use was reliable (α = .74) and while it could be improved upon slightly by removing items, in order to keep the measures used in Study 1 and Study 2 consistent,

and because reliability obtained with all items was above the acceptable threshold of .70, no items were removed. Thus, average smartphone usage (M = 3.77, SD = 0.57) was created using all 13 items.

BIS/BAS. The BIS/BAS scale was originally created as a four-factor scale with a BIS subscale and three BAS subscales (Drive, Reward Responsiveness, and Fun Seeking). However, the scale also works well as a two-factor scale treating the BIS as one factor and the three subscales of the BAS together as a factor (Jorm, Chirstensen, Henderson, Jacomb, Korten, & Rodgers, 1999). After comparing the internal consistency reliability, skewness, kurtosis, and correlations treating the scale as both a two-factor and four-factor scale, I decided that with this sample, it appeared to function better as a two-factor scale. See reliability statistics for both options in Table 4 below.

Table 4. Comparison of two-factor and four-factor treatment of BIS/BAS scale.

		Four-Factor			**Two-Factor**		
		Alpha[a]	Skew[b]	Kurtosis	Alpha	Skew	Kurtosis
BIS		.75	-.32	-.61	.75	-.32	-.61
BAS	Drive	.78	-.12	-.65	.75	-.25	-.45
	Reward Resp.	.65	-.75	-.06			
	Fun Seeking	.63	-.28	-.63			

a. Cronbach's Alpha
b. Values reflect skewness and kurtosis scores before any outliers were removed or variable transformations were performed.

Treating the BIS/BAS scale as a two- rather than a four-factor scale corrects the low internal consistency reliability observed on the Reward Responsiveness and Fun Seeking subscales and also reduced the skewness observed on the Reward Responsiveness subscale without greatly increasing the skewness observed on the other two BAS subscales. It also produces correlations consistent with those observed by Jorm et al. (1999). Specifically, average BAS is positively correlated with positive mood (r =

.27, p = .001) and average BIS is positively correlated with negative mood (r = .23, p = .004).

After reverse scoring items 5 and 7, Cronbach's alpha for the seven item BIS subscale was acceptable (α = .75) and could not be further improved by removing any items. Thus, average BIS (M = 3.08, SD = .55) was calculated using all seven items.

Cronbach's alpha for the 13 items from the 3 BAS subscales was .74. While it could have been improved slightly, in order to keep the measures used in Study 1 and Study 2 the same, and because initial reliability was above the .70 threshold for acceptable, average BAS (M = 3.17, SD = 0.35) was calculated using all 13 items.

Mood measure. Participants were asked the extent to which "today's experiment caused you to feel each of the following emotions". In general, on a five-point scale where higher numbers indicate stronger feelings, participants did not report a strong emotional reaction on any of the six emotions: happy (M = 2.11, SD = 1.53), excited (M = 1.86, SD = 1.51), peaceful (M = 1.93, SD = 1.59), angry (M = 0.13, SD = 0.47), sad (M = 0.17, SD = 0.55), or anxious (M = 1.19, SD = 1.51). The positive (happy, excited, and peaceful) (M = 1.97, SD = 1.31) and negative emotions (angry, sad, and anxious) (M = 0.50, SD = 0.66) were averaged separately and then the average of the negative mood items was subtracted from the average of the positive mood items to create an overall mood index (M = 1.47, SD = 1.34) where high numbers indicate a more positive mood in reaction to the experiment.

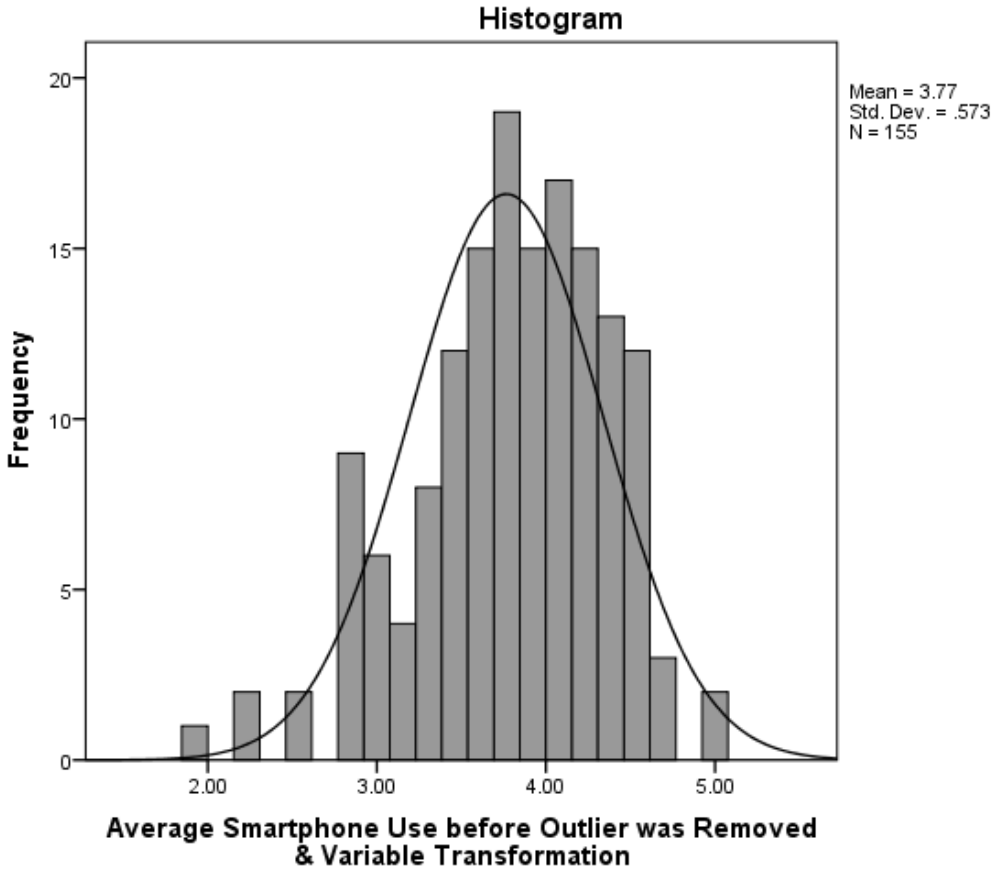
Check for normality and extreme cases. For each of the measures, statistics for skewness and kurtosis were obtained and both histograms and P-P plots were visually inspected to test for violations to assumptions of normality. Following the

recommendation of Fields (2009), skewness and kurtosis scores were converted to z-scores using the equations $Z_{skewness} = S - 0 / SE_{skewness}$ and $Z_{kurtosis} = K - 0 / SE_{kurtosis}$ respectively. Also per Fields (2009), based on the sample size, a z-score with an absolute value greater than 2.58 (significant at the $p < .01$ level) was considered to significantly deviate from normal. Kolmogorov-Smirnov with a Lilliefors correction (K-S/Lilliefors) was also performed to see whether the skewness was significant. However, because with larger samples sizes (around 200) the K-S/Lilliefors often yields a significant p-value for even small deviations from normality, the p-values alone were not used to determine whether or not to transform a variable (Field, 2009). Rather, visual inspection was used along with z-scores and K-S/Lilliefors in making individual judgments.

Average smartphone psychological ownership. Average SPO produced a distribution with a skewness of -.31 (*SE* = .20, z-score = -1.57) and a kurtosis of -.41 (*SE* = .39, z-score = -1.05), which did not significantly differ from normal [$D(155) = .05$, $p = .20$]. No outliers were identified and no correction was performed for this variable.

Average smartphone use. Initial average smartphone use produced a negatively skewed and leptokurtic distribution with a skewness of -.87 (*SE* = .19, z-score = -4.46) and a kurtosis of 1.37 (*SE* = .39, z-score = 3.56). The K-S/Lilliefors test [$D(156) = .09$, $p = .003$] indicated that the distribution was significantly negatively skewed (see Figure 3, below).

Figure 3. Histogram of average smartphone use before outlier was removed and variable transformation was performed.

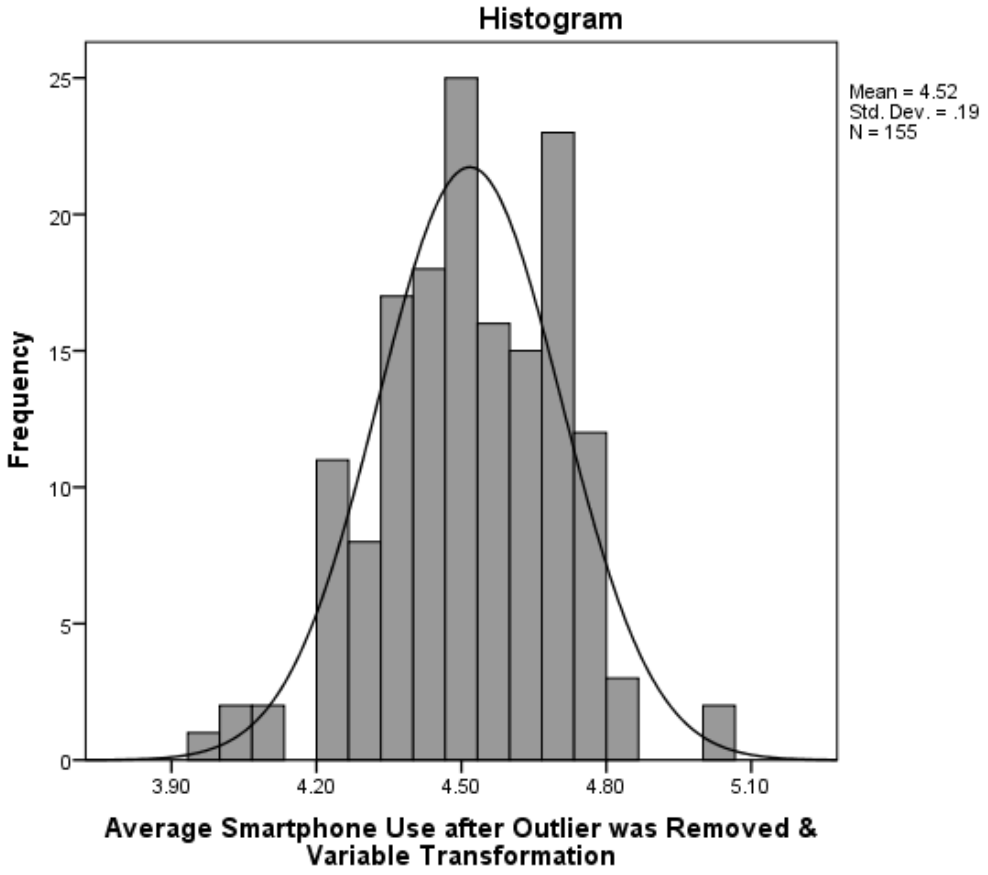


Visual inspection of the box-and-whisker plots revealed two participants that were potential outliers, both low on average smartphone use, whose scores at least partially accounted for the negative skewness. One was a fringelier (lying just at the +/- 3 standard deviation cut-off) at just -3.02 standard deviations below average. The other was further from the mean at -4.04 standard deviations below average. This participant was also 48 years old and reported not having gotten a smartphone until age 38. Because she was an outlier on three variables (age, age at which she acquired a smartphone, and smartphone use) this participant was removed from the data set. After removing the outlier, skewness was improved to -.60 (*SE* = .20, z-score = -3.07) and kurtosis was

improved to of .30 (*SE* = .39, z-score = 0.77), but the K-S/Lilliefors test [*D*(155) = .08, *p* = .01] still indicated that the distribution was significantly negatively skewed.

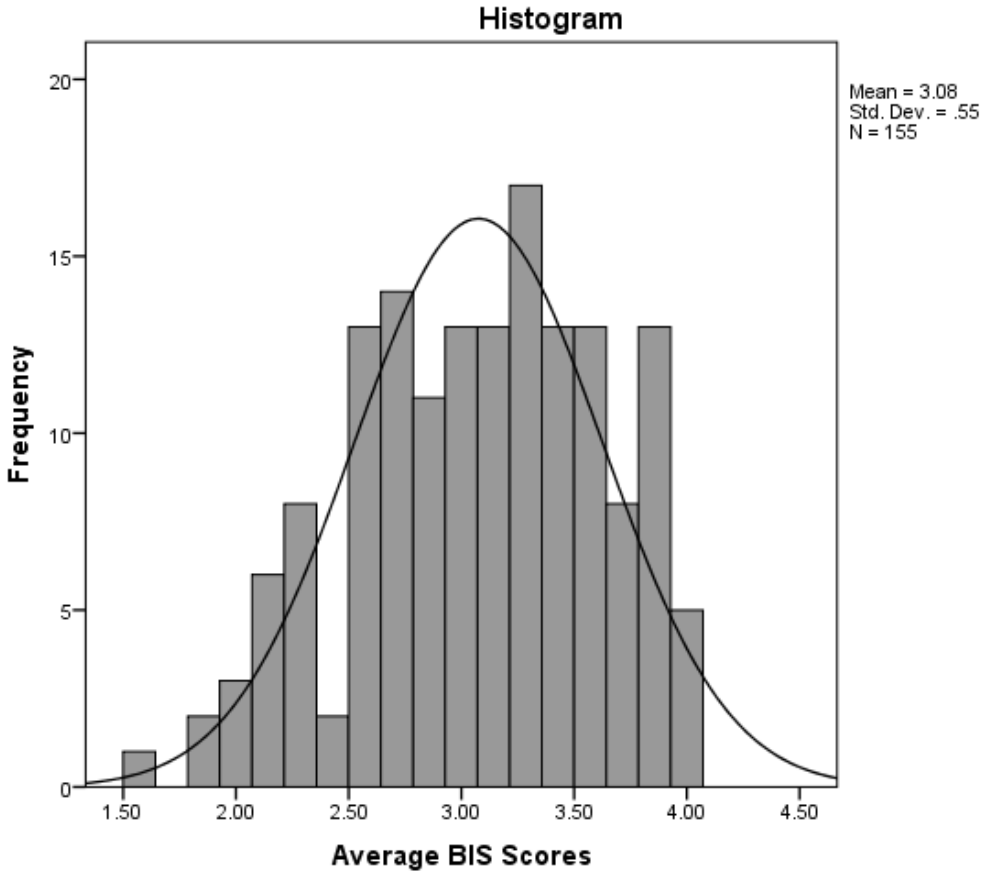
Next a square root transformation was performed by reflecting the variable, finding the square root, and re-reflecting the variable (so that positive values again indicated higher levels of use). The newly created variable produced a skewness of -.24 (*SE* = .20, z-score = -1.25) with a kurtosis of -.03 (*SE* = .39, z-score = -0.09). The K-S/Lilliefors test confirmed that this transformation successfully corrected the non-normality of the variable [*D*(155) = .06, *p* = .20] [see Figure 4, below]. Thus, the fringelier was retained and no further correction was made to the variable.

Figure 4. Histogram of average smartphone use after outlier was removed and variable transformation was performed.



BIS/BAS. The BIS subscale produced a distribution with a skewness of -.32 (*SE* = .20, z-score = -1.62) and a kurtosis of -.59 (*SE* = .39, z-score = -1.52) neither of which exceeded the 2.58 level of significant deviation from normal at the .01 level even though the K-S/Lilliefors produced a significant p-value [*D*(155) = .09, *p* = .002]. Visual inspection of the box-and-whisker plot revealed that there were no outliers. Standardized scores ranged from -2.72 to 1.68. Based on the absence of outliers, the visual inspection of the histogram (see Figure 5, below), and the z-scores, the decision was made not to transform this variable in any way or to remove any participants.

Figure 5. Frequency distribution of average BIS scores.



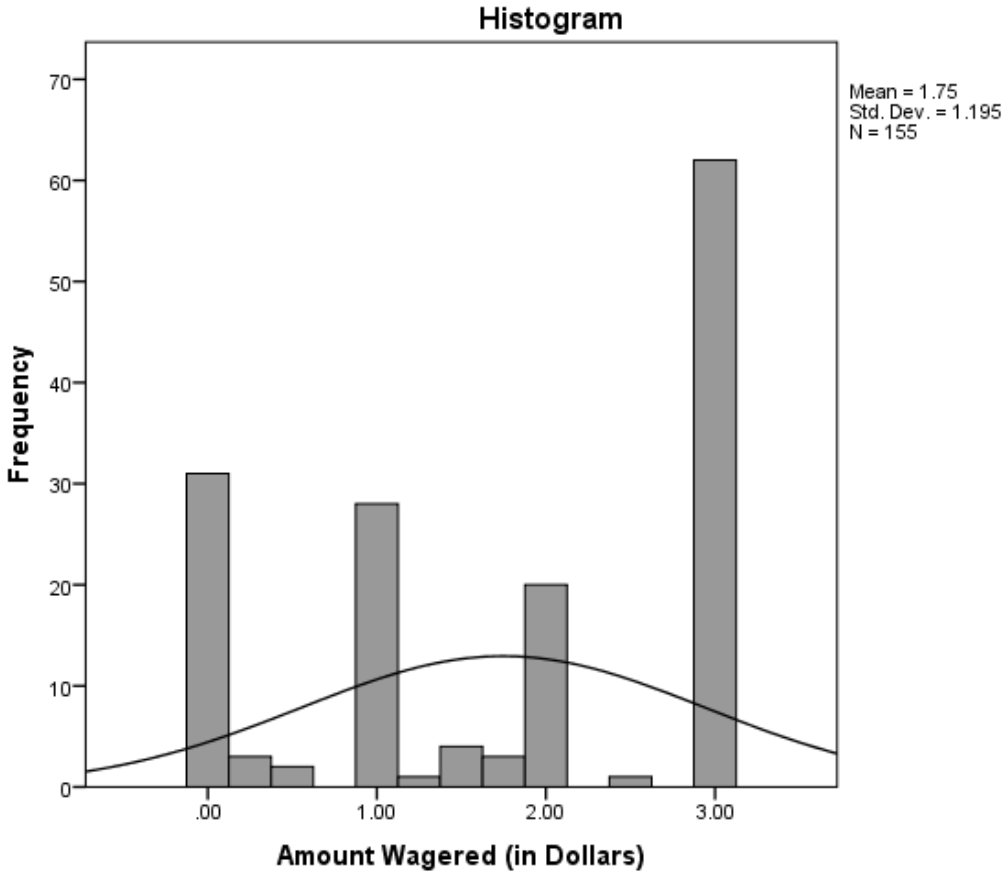
The BAS subscale produced a distribution with a skewness of -.18 (*SE* = .20, z-score = -0.91) and a kurtosis of -.45 (*SE* = .39, z-score = -1.17), which yielded a K-S/Lilliefors that was significant at .03 [*D*(155) = .08, *p* = .03] but not significant at the .01 level. Based on the z-scores and visual inspection of the frequency distribution and box-and-whisker plots, no participants were removed and no correction was made to this variable despite the significant p-value produced by the K-S/Lilliefors.

Moral orientation. The measure of moral orientation produced a strong bimodal distribution with participants tending to favor either the rule-based or the outcome-based reason supporting the decision rather than a less decisive middle point. The measure produced a skewness of -.44 (*SE* = .20) yielding a z-score of -2.26, which does not exceed the 2.58 level of significant deviation from normal at the .01 level. Because of the bimodal distribution, the distribution was also platykurtotic with a kurtosis of -1.26 (*SE* = .39) yielding a z-score of -3.25, which does significantly deviate from normal. While the distribution was significantly different from normal [*D*(155) = .24, *p* = .00], because there were no outliers on this variable, no scores were removed and no correction was performed for this variable.

Amount wagered. The amount wagered produced a distribution with a skewness of -.26 (*SE* = .20) yielding a z-score of -1.35, which does not exceed the 2.58 level of significant deviation from normal at the .01 level. The distribution produced a square-shaped distribution with a kurtosis of -1.50 (*SE* = .39) yielding a z-score of -3.87, which was confirmed as significantly different from normal by the K-S/Lilliefors [*D*(155) = .25, *p* = .00]. This appears to have resulted due to the fact that participants preferred to wager in whole dollar amounts ($0.00, $1.00, $2.00, or $3.00) rather than in increments falling

somewhere in between (e.g., $1.50 or $2.25) with the majority preferring to wager either none of their compensation or all of their compensation (see Figure 6 below). No outliers were identified and no correction was performed for this variable.

Figure 6. Frequency distribution of amount wagered.

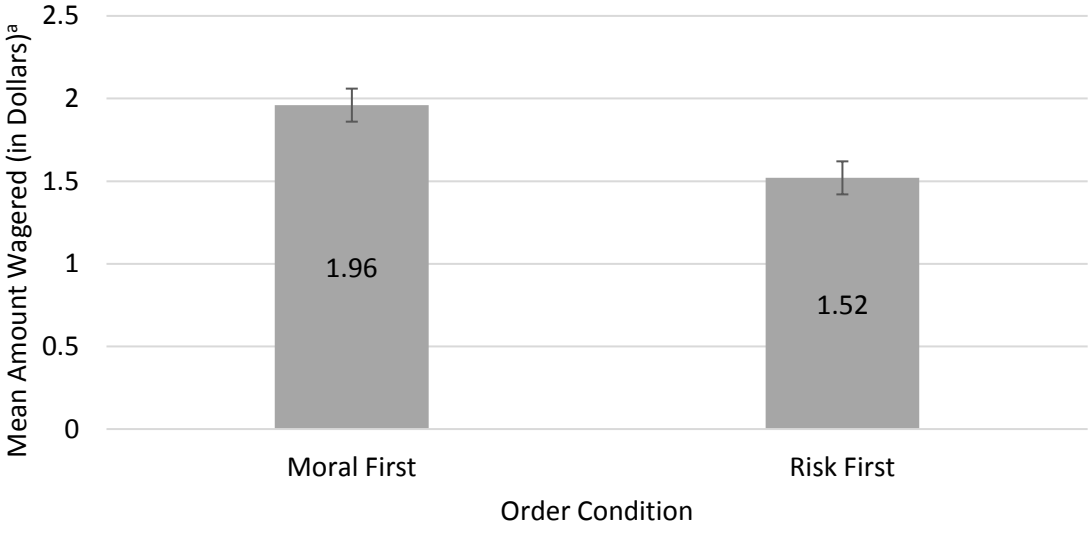


Effect of moral outcome. First, a 2 (custody: access vs. deprivation) by 2 (object: smartphone vs. student ID) by 2 (moral outcome: accept vs. reject) by 2 (order: moral-orientation first vs. risk-taking first) multivariate analysis of variance (MANOVA) was conducted on psychological power (BIS and BAS), risk-taking, and moral orientation. The MANOVA revealed no main effect of moral outcome on moral orientation [$F(1, 154) = 0.18$, $p = .67$, $\eta^2_p = .00$], amount wagered [$F(1, 154) = .29$, $p =$

.59, η^2_p = .00], average BIS [F(1, 154) = 0.02, p = .88, η^2_p = .00], or average BAS [F(1, 154) = 0.99, p = .32, η^2_p = .01]. Thus, moral orientation was collapsed for all further analysis leaving eight conditions.

Effect of order. The same MANOVA was used to test the effect of order and revealed that there were no main effects of order on moral orientation [F(1, 154) = 0.12, p = .74, η^2_p = .00], average BIS [F(1, 154) = 0.02, p = .88, η^2_p = .00], or average BAS [F(1, 154) = 1.26, p = .26, η^2_p = .01]; however, there was a significant main effect of order on amount wagered [F(1, 154) = 6.05, p = .02, η^2_p = .04] such that those who wagered later (in the moral-orientation first condition), on average, wagered more (M = \$1.96) than those who wagered earlier (in the risk-taking first condition) (M = \$1.50) (see Figure 7, below).

Figure 7. Unexpected significant main effect of order on amount wagered.



a. Error bars represent +/- 1 SE.[17]

[17] SE = s/√W = 1.19/√155 = 1.19/12.45 = .10

Because (a) this factor was nearly balanced with close to an equal number of observations in the risk-taking first (n = 76) and moral orientation first (n = 79) conditions, and (b) because the significant difference was not of theoretical interest[18], this factor was also collapsed for further analysis. Thus, the final design was a 2 (custody: access vs. deprivation) by 2 (object: smartphone vs. student ID) mixed-model design with four condition.

Test of mood effects. A 2 (custody: access vs. deprivation) by 2 (object: smartphone vs. student ID) univariate analysis of variance (ANOVA) was done to test for mood effects using the overall mood index variable. No main effects of custody [F(1, 154) = 0.04, p = .84, η^2_p = .00] or object [F(1, 154) = 1.01, p = .32, η^2_p = .01] were observed on mood, nor was there a significant two-way object-by-custody interaction on mood [F(1, 154) = .03, p = .87, η^2_p = .00]. Thus, the object and custody manipulations appeared not to have significantly impacted participants' mood. Of particular importance, the smartphone deprivation condition did not lead to negative affective states such as increased anxiety as was found by Kamenetz (2015).

Detection of covariates. Finally, correlational analyses were run to see whether significant correlations existed between any of the outcome measures, and any of the following possible extraneous factors: session size (i.e., number of participants in a given data collection session), smartphone use, smartphone satisfaction, smartphone functionality, length of smartphone ownership (both overall and for the current device), age, and mood. Each possible covariate was tested to see whether it correlated with any

[18] Although it is of practical interest and is discussed in more detail in the Discussion section of this chapter.

of the dependent variables (average BIS, average BAS, amount wagered, and moral orientation) [see Table 5, below]. None of the variables tested significantly correlated with average BIS, moral orientation, or amount wagered. Average BAS was significantly correlated with participants' responses on the mood check (r = .25, p = .002) such that those that reported higher scores on the measure of BAS also reported a more positive mood at the end of the experiment, which is consistent with the Approach/Inhibition theory of psychological power (Keltner, et al. 2003). Based on these results, mood was included as a covariate in the main analyses.

Table 5. Correlational analyses to detect possible covariates in Study 1.

Correlations													
		Average BIS	Average BAS	Moral Orientation	Amount Wagered	Session Size	Participant Age	Age First Got Smartphone	Smartphone Tenure	Months Owned Smartphone	Smartphone Functionality	Smartphone Satisfaction	Average Mood
Average BIS	Pearson Correlation	1	-.034	-.108	-.199*	-.061	-.056	-.137	.096	.011	.117	.036	-.086
	Sig. (2-tailed)		.676	.183	.013	.452	.488	.088	.233	.891	.148	.658	.288
	N	155	155	155	155	155	155	155	155	154	155	155	155
Average BAS	Pearson Correlation	-.034	1	.226**	.065	-.043	-.104	-.099	.044	.078	.002	-.030	.246**
	Sig. (2-tailed)	.676		.005	.419	.597	.199	.220	.587	.336	.983	.711	.002
	N	155	155	155	155	155	155	155	155	154	155	155	155
Moral Orientation	Pearson Correlation	-.108	.226**	1	-.029	-.070	.002	.098	-.090	.035	.062	-.035	.152
	Sig. (2-tailed)	.183	.005		.718	.387	.983	.223	.267	.667	.447	.670	.058
	N	155	155	155	155	155	155	155	155	154	155	155	155
Amount Wagered	Pearson Correlation	-.199*	.065	-.029	1	.050	-.026	.005	-.017	.077	-.081	-.088	-.057
	Sig. (2-tailed)	.013	.419	.718		.541	.748	.950	.830	.342	.315	.274	.483
	N	155	155	155	155	155	155	155	155	154	155	155	155

*Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Main Analysis

To test the predicted object-by-custody interactions on psychological power, risk-taking, and moral orientation, a separate hierarchical simultaneous regression was conducted for each dependent variable. Hierarchical simultaneous regression was used rather than MANOVA so that the predicted moderation effect of smartphone psychological ownership could be tested in the same analysis (since psychological ownership is being treated as a continuous predictor). Categorical predictors (i.e., custody and object) were coded using effects coding [see Table 6, below].

Table 6. Effects coding for categorical predictors.

Factor	Condition	Code
Custody	Access	1
	Deprivation	-1
Object	Smartphone	1
	Student ID	-1

The continuous predictor (i.e., smartphone psychological ownership) was centered by subtracting the scale mean from each participants' score.

Mood was controlled for in Block 1 of the regression analyses. Block 2 of the hierarchical simultaneous regression tested the main effect of custody and object. Block 3 tested the interaction between custody and object. This served as the test of Hypotheses 1, 2, and 3. Block 4 of the hierarchical simultaneous regression tested the moderating effect of SPO. Centered SPO was entered as a continuous predictor. Interaction terms were created between SPO and categorical predictors by multiplying the centered SPO variable with each the object and custody effects coded variables. Also a three-way interaction term was created for SPO, object, and custody. All of these predictors were

entered into Block 4 of the regression model. The effect of the 3-way object-by-custody -by-SPO interaction on psychological power served as the test of Hypothesis 6.

Psychological power. Recall that Hypothesis 1 predicted a significant object-by-custody interaction such that compared with those in the smartphone deprivation condition, those in the smartphone access condition will exhibit more psychological power as measured using the BIS/BAS scales. No such difference was predicted in the student ID condition. Also, Hypothesis 6 predicted that SPO will moderate the effect of smartphone custody on psychological power such that those with higher levels of SPO would be more affected by the custody manipulation, and those with lower levels of SPO will be less effected by the custody manipulation. Because there were two dependent measures of psychological power (BIS and BAS). Hypothesis 1 and Hypothesis 6 were split into Hypothesis 1a and Hypothesis 6a (for BIS) and Hypothesis 1b and Hypothesis 6b (for BAS) respectively. Two separate hierarchical simultaneous regressions were conducted, one for each dependent measure (BIS and BAS). Both were conducted according to the procedures described above.

BIS. Block 1 of the hierarchical simultaneous regression revealed that mood only accounted for 0.7% of variance [r^2 = .01, $F\Delta(1, 153) = 1.14$, $p = .29$] and did not significantly predict BIS scores [b = -.04, β = -.09, $t(154) = -1.07$, $p = .29$].

Block 2, which tested the main effects of custody and object, only accounted for 0.2% more variance in BIS scores [r^2 = .01, $F\Delta(2, 151) = 0.18$, $p = .84$]. No main effects had been predicted for either factor, and none was observed for either custody [b = .02, β = .04, $t(154) = 0.44$, $p = .66$] or object [b = -.02, β = -.03, $t(154) = -0.40$, $p = .69$].

Block 3, which tested the interaction between custody and object, only accounted for 0.1% more variance [r^2 = .01, $F\Delta(1, 150) = 0.16$, p = .69]. A significant two-way interaction had been predicted between object and custody (Hypothesis 1a), but was not observed [b = -.02, β = -.03, $t(154) = -0.40$, p = .69]. Thus Hypothesis 1a was not supported.

Block 4, which tested the moderating effects of SPO accounted for an additional 8.9% of variance in BIS scores which is a significant change in the amount of variance explained [r^2 = .10, $F\Delta(4, 146) = 3.63$, p = .01]. There was an unexpected main effect of SPO on BIS scores [b = .19, β = .28, $t(154) = 3.44$, p = .001] such that a one point increase in SPO scores would predict a .19 increase in BIS scores. No significant two-way interactions had been predicted between SPO and object [b = -.05, β = -.07, $t(154) = -0.92$, p = .36] or custody [b = -.42, β = -.06, $t(154) = -0.81$, p = .42] and none was observed for either. A significant three-way object-by-custody-by-SPO interaction had been predicted (Hypothesis 6a), but was not observed [b = -.03, β = -.04, $t(154) = -0.48$, p = .63]. Thus Hypothesis 6a was not supported (see the coefficients in Table 7 below).

Table 7. Coefficients produced by the hierarchical simultaneous regression on BIS.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	3.127	.066		47.718	.000
	Average Mood	-.035	.033	-.086	-1.065	.288
2	(Constant)	3.127	.066		47.376	.000
	Average Mood	-.034	.033	-.084	-1.030	.305
	Custody	.020	.044	.036	.443	.658
	Object	-.018	.045	-.033	-.401	.689
3	(Constant)	3.127	.066		47.246	.000
	Average Mood	-.034	.033	-.084	-1.033	.303
	Custody	.020	.045	.037	.449	.654
	Object	-.018	.045	-.034	-.412	.681
	Object-by-Custody	-.018	.045	-.032	-.399	.690
4	(Constant)	3.167	.066		48.343	.000
	Average Mood	-.064	.034	-.156	-1.905	.059
	Custody	.038	.043	.069	.877	.382
	Object	-.015	.043	-.027	-.346	.730
	Object-by-Custody	-.027	.043	-.049	-.617	.538
	Average SPO	.186	.054	.284	3.438	.001
	Object-by-SPO	-.048	.053	-.074	-.920	.359
	Custody-by-SPO	-.042	.052	-.064	-.811	.419
	Three Way	-.025	.052	-.038	-.479	.632

a. Dependent Variable: Average BIS

Legend: Average BIS = average BIS score, Average Mood = average for mood check items, Custody = effects coded custody categorical predictor, Object = effects coded object categorical predictor, Object-by-Custody = object-by-custody interaction, Average SPO = centered average SPO, Object-by-SPO = object-by-SPO interaction, Custody-by-SPO = custody-by-SPO interaction, Three Way = object-by-custody-by-SPO three-way interaction.

BAS. Block 1 of the hierarchical simultaneous regression revealed that mood accounted for 6.1% of variance [r^2 = .06, $F\Delta(1, 153) = 9.86$, p = .002] which significantly predicted BAS scores [b = .06, β = .25, $t(154) = 3.14$, p = .002]. An increase of one point in mood would predict a .06 increase in BAS.

Block 2, which tested the main effects of custody and object, only accounted for 0.4% more variance in BAS scores [r^2 = .07, $F\Delta(2, 151) = 0.35$, p = .71]. No main

effects had been predicted for either factor, and none was observed for either custody [*b* = -.02, β = -.04, *t*(154) = -0.56, *p* = .58] or object [*b* = .02, β = .05, *t*(154) = 0.62, *p* = .54].

Block 3, which tested the interaction between custody and object, only accounted for 0.4% more variance [r^2 = .07, *F*Δ(1, 150) = 0.64, *p* = .43]. A significant two-way interaction had been predicted between object and custody (Hypothesis 1b), but was not observed [*b* = -.02, β = -.03, *t*(154) = -0.40, *p* = .65]. Thus Hypothesis 1b was not supported.

Block 4, which tested the moderating effects of SPO only accounted for an additional 2.9% of variance in BAS scores [r^2 = .10, *F*Δ(4, 146) = 1.17, *p* = .33]. Again, as was the case with BIS, here was an unexpected significant main effect of SPO on BAS scores [*b* = .07, β = .17, *t*(154) = 2.02, *p* = .05] such that a one point increase in SPO scores would be expected to result in a .07 increase in BAS scores. No significant two-way interactions had been predicted between SPO and object [*b* = .03, β = .08, *t*(154) = 1.02, *p* = .31] or custody [*b* = .01, β = .02, *t*(154) = 0.23, *p* = .82] and none was observed for either. A significant three-way object-by-custody-by-SPO interaction had been predicted (Hypothesis 6b) but was not observed [*b* = .00, β = .00, *t*(154) = 0.06, *p* = .96]. Thus Hypothesis 6b was not supported (see the coefficients in Table 8 below).

Table 8. Coefficients produced by the hierarchical simultaneous regression on BAS.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	3.081	.040		76.596	.000
	Average Mood	.064	.020	.246	3.140	.002
2	(Constant)	3.082	.040		76.151	.000
	Average Mood	.063	.020	.243	3.074	.003
	Custody	-.015	.027	-.044	-.557	.579
	Object	.017	.027	.049	.621	.535
3	(Constant)	3.081	.041		76.054	.000
	Average Mood	.063	.020	.244	3.081	.002
	Custody	-.016	.027	-.045	-.571	.569
	Object	.018	.027	.051	.645	.520
	Object-by-Custody	.022	.027	.063	.800	.425
4	(Constant)	3.099	.041		74.896	.000
	Average Mood	.051	.021	.199	2.428	.016
	Custody	-.010	.027	-.028	-.355	.723
	Object	.020	.027	.057	.716	.475
	Object-by-Custody	.023	.027	.068	.855	.394
	Average SPO	.069	.034	.167	2.015	.046
	Object-by-SPO	.034	.033	.082	1.023	.308
	Custody-by-SPO	.007	.033	.018	.226	.822
	Three Way	.002	.033	.004	.056	.955

a. Dependent Variable: Average BAS

Legend: Average BAS = average BAS score, Average Mood = average on mood check items, Custody = effects coded custody categorical predictor, Object = Effects coded object categorical predictor, Object-by-Custody = object-by-custody interaction, Average SPO = centered average SPO, Object-by-SPO = object-by-SPO interaction, Custody-by-SPO = custody-by-SPO interaction, Three Way = object-by-custody-by-SPO three-way interaction.

Risk taking. Recall that Hypothesis 2 predicted a significant object-by-custody interaction on risk-taking behavior such that compared with those in the smartphone deprivation condition, those in the smartphone access condition would exhibit more risk-taking behavior as measured by the gambling task. No such difference was expected in the student ID condition. Recall also that risk-taking behavior was measured as the amount of a participant's compensation that he or she chose to wager.

Block 1 of the hierarchical simultaneous regression revealed that mood only accounted for 0.3% of variance [r^2 = .00, $F\Delta(1, 153) = 0.50$, p = .48] and did not significantly predict amount wagered [b = -.05, β = -.06, $t(154) = -0.70$, p = .48].

Block 2, which tested the main effects of custody and object, accounted for 2.4% more variance in amount wagered [r^2 = .03, $F\Delta(2, 151) = 1.90$, p = .15]. No main effects had been predicted for custody [b = -.16, β = -.14, $t(154) = -1.71$, p = .09] or object [b = .09, β = .08, $t(154) = 0.93$, p = .36] and none were observed for either.

Block 3, which tested the interaction between custody and object, only accounted for 0.1% more variance [r^2 = .03, $F\Delta(1, 150) = 0.15$, p = .70]. A significant two-way object-by-custody interaction had been predicted (Hypothesis 2), but was not observed [b = .04, β = .03, $t(154) = 0.39$, p = .70]. Thus Hypothesis 2 was not supported.

Block 4, which tested the moderating effects of SPO accounted for an additional 3.2% of variance in amount wagered [r^2 = .06, $F\Delta(4, 146) = 1.24$, p = .30]. Hypothesis 4 predicted that power would mediate the effect of smartphone custody on risk taking. This hypothesis is tested using a separate analysis and is discussed later in this chapter. No main effect had been predicted for SPO on risk taking and none was observed [b = -.11, β = -.08, $t(154) = -0.94$, p = .35]. No interactions had been predicted between SPO and custody [b = -.22, β = -.15, $t(154) = -1.85$, p = .07] or object [b = .05, β = .03, $t(154) = 0.39$, p = .70] and none were observed for either. No significant three-way object-by-custody-by-SPO interaction had been predicted and none was observed [b = -.09, β = -.06, $t(154) = -0.76$, p = .45] (see the coefficients in Table 9 below).

Table 9. Coefficients produced by the hierarchical simultaneous regression on amount wagered.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.821	.143		12.766	.000
	Average Mood	-.051	.072	-.057	-.704	.483
2	(Constant)	1.819	.142		12.806	.000
	Average Mood	-.054	.072	-.061	-.754	.452
	Custody	-.163	.096	-.137	-1.706	.090
	Object	.089	.096	.075	.927	.355
3	(Constant)	1.819	.142		12.767	.000
	Average Mood	-.054	.072	-.060	-.746	.457
	Custody	-.164	.096	-.138	-1.708	.090
	Object	.090	.096	.076	.936	.351
	Object-by-Custody	.037	.096	.031	.388	.699
4	(Constant)	1.785	.145		12.282	.000
	Average Mood	-.043	.074	-.048	-.577	.565
	Custody	-.177	.096	-.148	-1.834	.069
	Object	.084	.096	.071	.873	.384
	Object-by-Custody	.041	.096	.035	.430	.668
	Average SPO	-.113	.120	-.079	-.939	.349
	Object-by-SPO	.046	.117	.032	.390	.697
	Custody-by-SPO	-.215	.116	-.150	-1.851	.066
	Three Way	-.088	.116	-.062	-.755	.451

a. Dependent Variable: Amount Wagered

Legend: Average Mood = average on mood check items, Custody = effects coded custody categorical predictor, Object = effects coded object categorical predictor, Object-by-Custody = object-by-custody interaction, Average SPO = centered average SPO, Object-by-SPO = object-by-SPO interaction, Custody-by-SPO = custody-by-SPO interaction, Three Way = object-by-custody-by-SPO three-way interaction.

Moral orientation. Recall that Hypothesis 3 predicted a significant object-by-custody interaction such that compared with participants in the smartphone deprivation condition, participants in the smartphone access condition would report a stronger preference for moral decision making based on deontological/rule-based arguments. No such difference was expected in the student ID condition.

Block 1 of the hierarchical simultaneous regression revealed that emotion accounted for 2.3% of variance [r^2 = .02, $F\Delta(1, 154) = 3.64$, p = .06] which did not significantly predict moral orientation [b = .31, β = .15, $t(154) = 1.91$, p = .06].

Block 2, which tested the main effects of custody and object, only accounted for 0.9% more variance in moral orientation [r^2 = .03, $F\Delta(2, 151) = 0.68$, p = .51]. No main effects had been predicted for either factor, and none was observed for either custody [b = -.07, β = -.03, $t(154) = -0.31$, p = .76] or object [b = .24, β = .09, $t(154) = 1.12$, p = .26].

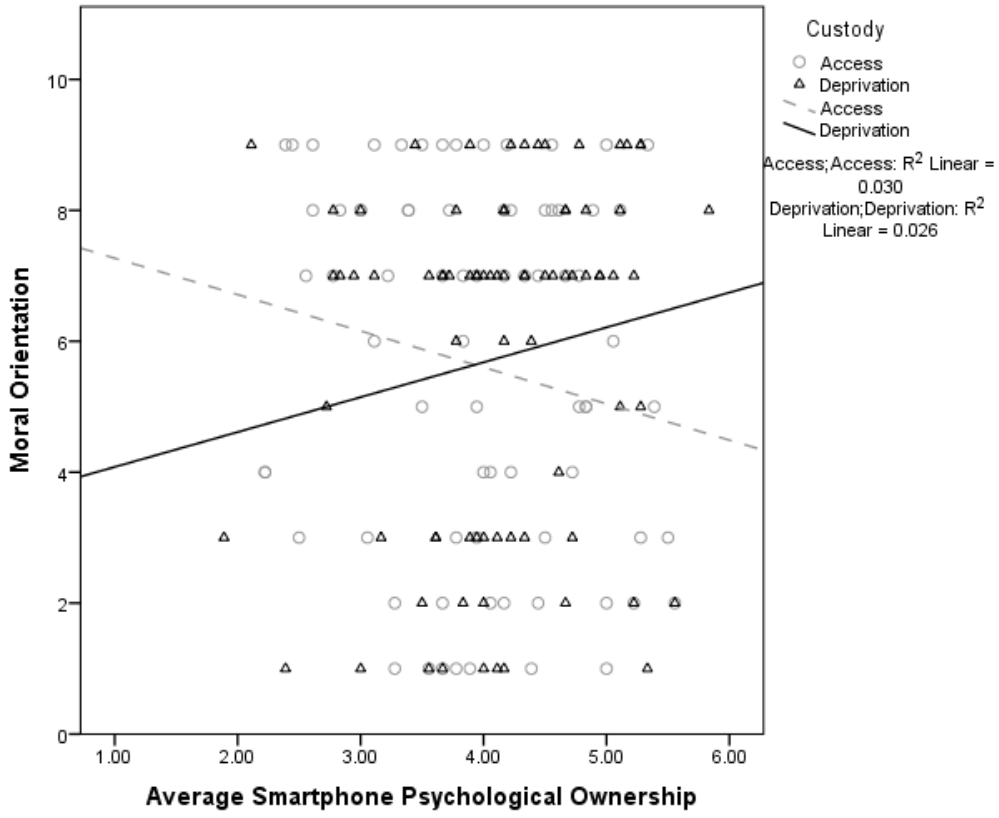
Block 3, which tested the interaction between custody and object, only accounted for 0.1% more variance [r^2 = .03, $F\Delta(1, 150) = 0.13$, p = .72]. A significant two-way object-by-custody interaction had been predicted (Hypothesis 3), but was not observed [b = .08, β = .03, $t(154) = 0.36$, p = .72]. Thus, Hypothesis 3 was not supported.

Block 4, which tested the moderating effects of SPO only accounted for an additional 3.2% of variance in moral orientation [r^2 = .06, $F\Delta(4, 146) = 1.23$, p = .30]. Hypothesis 5 predicted that power would mediate the effect of smartphone custody on moral orientation, which was tested using a separate analysis and is discussed later in this chapter. No main effect of SPO on moral orientation had been predicted and none was observed [b = -.16, β = -.05, $t(154) = -0.58$, p = .56]. No significant interactions was predicted between SPO and object and none was observed [b = -.15, β = -.05, $t(154) = -0.58$, p = .57]. Although no two-way custody-by-SPO interaction had been predicted for moral orientation, one was observe [b = -.53, β = -.16, $t(154) = -2.00$, p = .05[19]]. For those in the access condition, there was a negative but non-significant correlation

[19] p = .048

between SPO and moral orientation (r = -.17, p = .14) suggesting that those with higher levels of SPO showed a slight preference for an outcome-based or consequentialist moral orientation. However, for those in the deprivation condition, there as a positive but non-significant correlation between SPO and moral orientation (r = .16, p = .15) suggesting that those with higher levels of SPO showed a slight preference for a rule-based or deontological moral orientation. While neither of these correlations is significant, the two-way interaction suggests that the lines are significantly non-parallel and the scatterplot in Figure 8 (below) shows that there is a crossover interaction between SPO and custody on moral orientation (see the coefficients in Table 10 below).

Figure 8. Scatterplot depicting the unexpected significant, two-way, custody-by-SPO, crossover interaction.



Legend:
Moral Orientation = higher values indicate a rule-based moral reasoning style and lower values indicate an outcome-based moral reasoning style, Access = access condition, Deprivation = deprivation condition.

Table 10. Coefficients produced by the hierarchical simultaneous regression on moral orientation.

Coefficients[a]

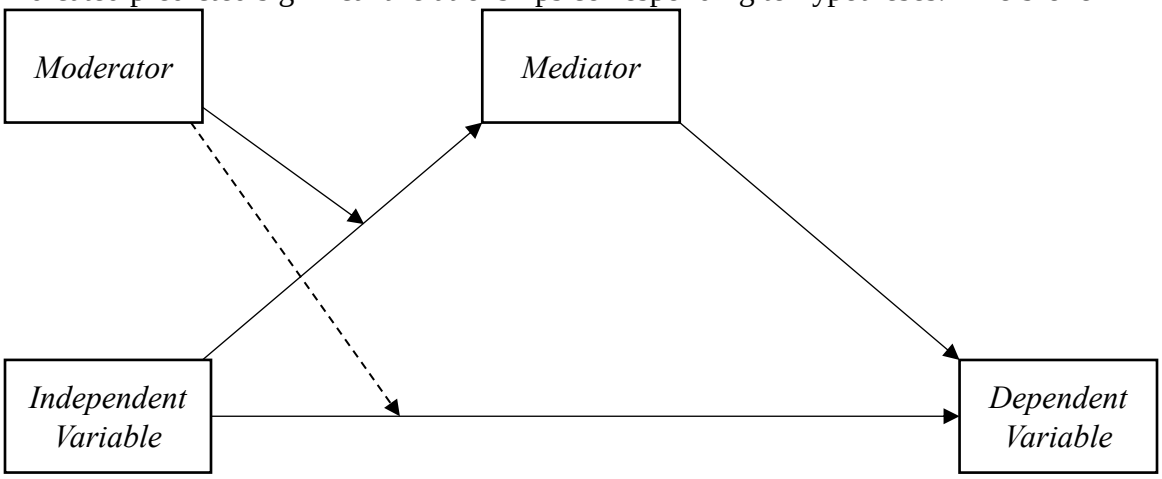
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.237	.322		16.276	.000
	Average Mood	.309	.162	.152	1.908	.058
2	(Constant)	5.251	.323		16.257	.000
	Average Mood	.295	.163	.145	1.810	.072
	Custody	-.067	.217	-.025	-.306	.760
	Object	.244	.218	.090	1.121	.264
3	(Constant)	5.250	.324		16.207	.000
	Average Mood	.296	.163	.146	1.810	.072
	Custody	-.068	.218	-.025	-.312	.755
	Object	.247	.219	.091	1.128	.261
	Object-by-Custody	.078	.218	.029	.357	.722
4	(Constant)	5.163	.331		15.617	.000
	Average Mood	.320	.169	.158	1.893	.060
	Custody	-.081	.219	-.030	-.368	.713
	Object	.259	.219	.095	1.181	.239
	Object-by-Custody	.063	.219	.023	.287	.774
	Average SPO	-.159	.274	-.049	-.581	.562
	Object-by-SPO	-.153	.265	-.047	-.576	.566
	Custody-by-SPO	-.528	.264	-.161	-1.996	.048
	Three Way	.074	.265	.023	.280	.780

a. Dependent Variable: Moral Orientation

Legend: Average Mood = average of the mood-check items, Custody = effects coded custody categorical predictor, Object = effects coded object categorical predictor, Object-by-Custody = object by custody interaction, Average SPO = centered average SPO, Object-by-SPO = object-by-SPO interaction, Custody-by-SPO = custody-by-SPO interaction, Three Way = object-by-custody-by-SPO three-way interaction.

Moderated mediation. The newer PROCESS procedures by Hayes (2012) allows moderated mediation to be tested in a single analysis and thus, for this analysis, is preferable to the older Preacher and Hayes (2004) procedure. This procedure was used to test all predictions involving mediation and/or moderation (and Hypotheses 4 and 5 in particular that were not tested using the hierarchical simultaneous regression). Figure 9 (below) depicts the conceptual model tested in this section.

Figure 9. Conceptual model tested using Hayes (2012) PROCESS procedure. Solid lines indicated predicted significant relationships corresponding to hypotheses. The broken line was not specifically predicted to be significant.

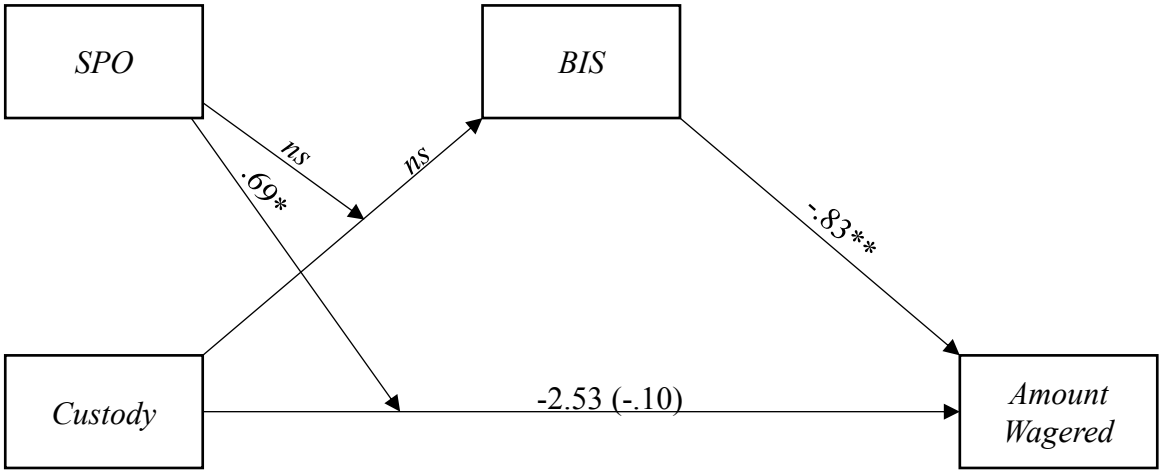


Risk taking. Hypotheses 4 predicted that psychological power would partially mediate the effect of smartphone custody on risk taking. Hypothesis 6 predicted that SPO would moderate the effect of smartphone custody on psychological power such that those with higher levels of SPO would be more affected by the custody manipulation, and those with lower levels of SPO would be less affected by the custody manipulation. Thus power was predicted to mediate the relationship between custody and risk taking while SPO was predicted to moderate the relationships between custody and psychological power (moderated mediation).

Because these predictions pertain only to smartphone custody (not to student ID custody), this analysis was run only on participants in the smartphone condition (n = 79). Also, because there were two measures of psychological power (BIS and BAS) two separate analyses were run and Hypothesis 4 was split into Hypothesis 4a (BIS) and Hypothesis 4b (BAS).

First, the analysis of moderated mediation was done to assess the relationship between smartphone custody and risk taking as mediated by BIS and moderated by SPO. The model is depicted in Figure 10 below.

Figure 10. Test of Hypothesis 4a and Hypothesis 6. Values represent unstandardized regression coefficients. Value in parentheses represents unstandardized regression coefficient after controlling for the mediator. * > .05. ** > .01.



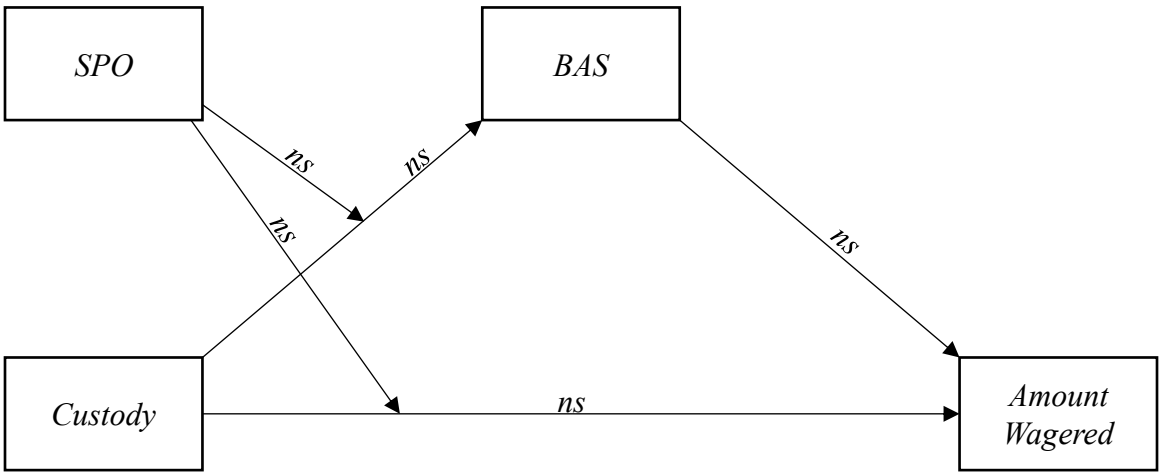
This analysis revealed that, paralleling the regression results previously reported, smartphone custody did not significantly predict BIS (b = -.48, t(78) = -0.73, p = .47)[20]. Also, that relationship was not significantly moderated by SPO (b = .12, t(78) = 0.71, p = .48). Smartphone custody did not significantly predict the amount wagered (b = -2.53, t(78) = -1.83, p = .07). Although not specifically predicted, SPO did significantly moderate the effect of smartphone custody on amount wagered (b = .69, t(78) = 2.05, p = .04). BIS significantly predicted amount wagered (b = -.83, t(78) = -3.47, p = .00[21]) such that higher levels of BIS were associated with lower levels of risk taking. Of primary interest, the indirect effect of the interaction between custody and SPO on amount

[20] All reported coefficients are unstandardized per the recommendation of Hayes (2012).
[21] p = .0009

wagered (risk-taking) is .12(-.83) = -.10. A 95% bootstrap confidence interval for this indirect effect (-.35 to .14) contains zero thus the indirect effect of smartphone custody on risk taking is not statistically different from zero and the mediation is not moderated. Interestingly, the 95% bootstrap confidence intervals at the 90th (.11 to 1.88) percentile do not contain zero indicating that for those with extremely high levels of SPO (5.11 and above), the indirect effect of smartphone custody on risk taking is significantly different from zero and thus the mediation is moderated at that level of SPO.

The second analysis used the exact same procedure described above. The only change was that BAS (rather than BIS) was treated as the mediator. The model is depicted in Figure 11 below.

Figure 11. Test of Hypothesis 4b and Hypothesis 6.



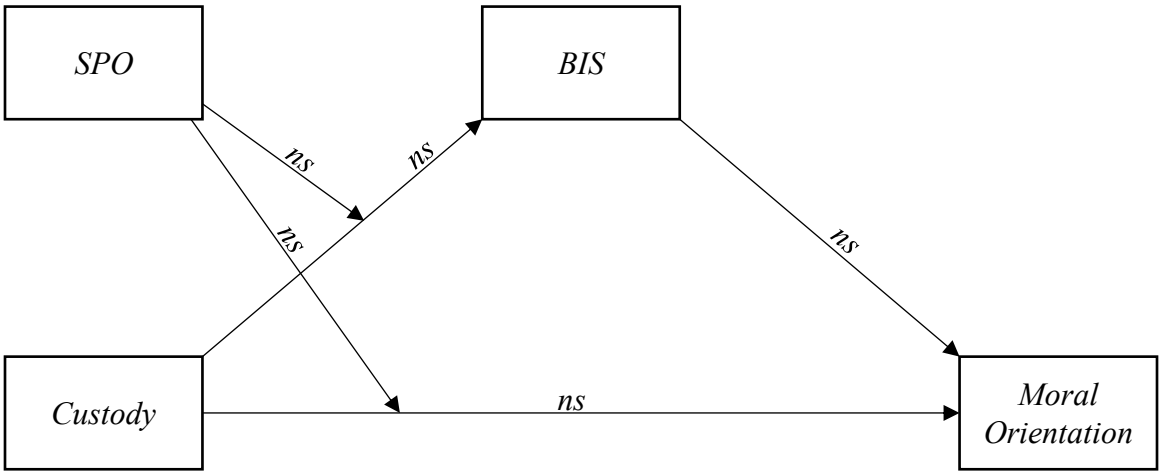
This analysis revealed that smartphone custody did not significantly predict BAS (b = -.02, t(78) = -0.06, p = .95). Also, that relationship was not significantly moderated by SPO (b = -.00, t(78) = -0.03, p = .97). Smartphone custody did not significantly predict the amount wagered (b = -2.12, t(78) = -1.43, p = .16). SPO did not significantly moderate the effect of smartphone custody on amount wagered (b = .59, t(78) = 1.65, p =

.10). BAS did not significantly predicted amount wagered (b = .38, $t(78)$ = 0.73, p = .47). Of primary interest, the indirect effect of the interaction between custody and SPO on amount wagered (risk-taking) is -.00(.38) = -.00. A 95% bootstrap confidence interval for this indirect effect (-.13 to .11) contains zero thus the indirect effect of smartphone custody on risk taking is not statistically different from zero and the mediation is not moderated. Unlike with BIS, this is true even at very high levels of SPO (90^{th} percentile).

Moral orientation. The identical Hayes (2012) PROCESS procedure was used to test the moderated mediation described in Hypotheses 5 and 6. Again psychological power was expected to mediate the relationship between custody and moral orientation while SPO was predicted to moderate the relationship between custody and psychological power (moderated mediation). Also, again because psychological power was measured two ways (BIS and BAS) Hypothesis 5 was split into Hypothesis 5a (BIS) and Hypothesis 5b (BAS).

First, the analysis of moderated mediation was done to assess the relationship between smartphone custody and moral orientation as mediated by BIS and moderated by SPO. The model is depicted in Figure 12 below.

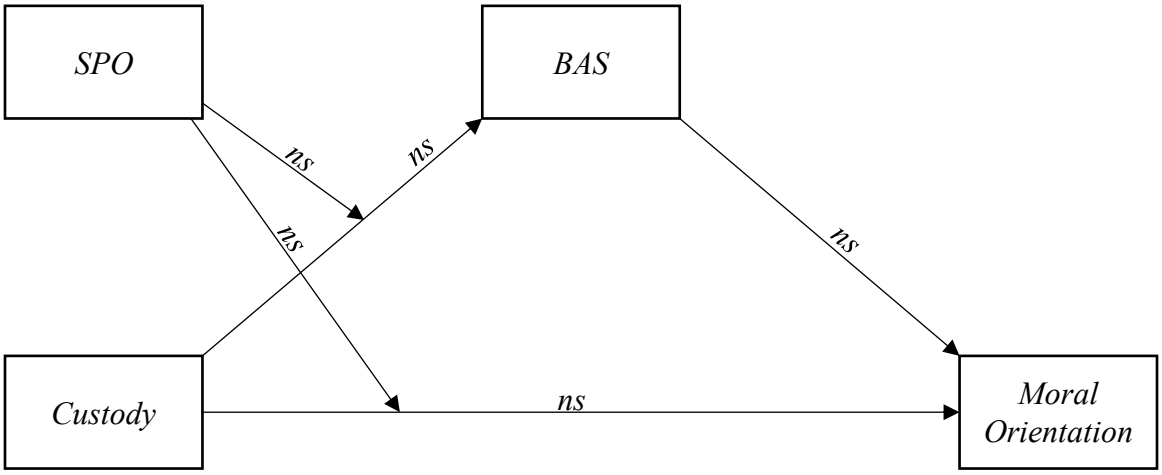
Figure 12. Test of Hypothesis 5a and Hypothesis 6.



This analysis revealed that smartphone custody did not significantly predict BIS (b = -.48, t(78) = -0.73, p = .47). Also, that relationship was not significantly moderated by SPO (b = .12, t(78) = .71, p = .48). Smartphone custody did not significantly predict moral orientation (b = -4.57, t(78) = -1.44, p = .16). SPO did not significantly moderate the effect of smartphone custody on moral orientation (b = 1.13, t(78) = 1.46, p = .15). BIS did not significantly predict moral orientation (b = -1.05, t(78) = -1.90, p = .06). Of primary interest, the indirect effect of the interaction between custody and SPO on moral orientation is .12(-1.05) = -.12. A 95% bootstrap confidence interval for this indirect effect (-.68 to .15) contains zero thus the indirect effect of smartphone custody on moral orientation is not statistically different from zero and the mediation is not moderated. This is true at all levels of the moderator (SPO).

Second, the analysis of moderated mediation was done to assess the relationship between smartphone custody and moral orientation as mediated by BAS and moderated by SPO. The model is depicted in Figure 13 below.

Figure 13. Test of Hypothesis 5b and Hypothesis 6



This analysis revealed that smartphone custody did not significantly predict BAS (b = -.02, t(78) = -0.06, p = .95). Also, that relationship was not significantly moderated by SPO (b = -.00, t(78) = -0.03, p = .97). Smartphone custody did not significantly predict moral orientation (b = -4.05, t(78) = -1.25, p = .21). SPO did not significantly moderate the effect of smartphone custody on moral orientation (b = 1.01, t(78) = 1.28, p = .20). BAS did not significantly predict moral orientation (b = 1.03, t(78) = 0.91, p = .37). Of primary interest, the indirect effect of the interaction between custody and SPO on amount wagered (risk-taking) is -.00(1.03) = -.00. A 95% bootstrap confidence interval for this indirect effect (-.30 to .24) contains zero thus the indirect effect of smartphone custody on moral orientation is not statistically different from zero and the mediation is not moderated. This was true at all levels of the moderator (SPO).

Discussion

Study 1 sought to test whether those allowed access to their smartphone had a greater sense of psychological power than did those deprived of access to their smartphone, and in turn whether smartphone-induced power increased risk-taking

behavior and promoted a rule-based moral reasoning style. Further, it sought to test whether the effect of smartphone custody on psychological power was moderated by a user's level of SPO. Results of the hierarchical simultaneous regression from Study 1 indicate that smartphone custody did not have the predicted effect on psychological power, nor did SPO moderate the effect of smartphone custody on psychological power. However, an unexpected main effect of SPO on both measures of power (BIS and BIS) was observed such that higher levels of SPO predicted higher levels of both BIS and BAS. This main effect of SPO was not observed on either risk taking or moral orientation. It seems counterintuitive that SPO would be positively correlated with both BIS (a measure of psychological power where higher scores indicate *lower* power) and BAS (a measure of psychological power where higher scores indicate *higher* power). Keltner et al. (2003) are clear that BIS and BAS are distinct, orthogonal constructs, but that they are often negatively correlated. This apparent contraction will be discussed in greater detail in Chapter 6 with the results of both studies taken together.

Moderated mediation analysis was consistent with the results of the regression analysis and further revealed that while BIS predicted risk taking in the direction predicted (higher BIS scores predicted less gambling), BIS did not predict moral orientation nor did BAS predict either risk taking or moral orientation.

One possibility for the lack of support for the hypotheses is that the measures of psychological power (BIS and BAS) were not successful in that they did not actually measure participants level of psychological power. However, theoretically and empirically consistent correlations were observed that suggest that they are valid measures of psychological power. While the moderated mediation analysis did not

indicate that BAS significantly predicted moral orientation, a positive correlation was observed between BAS and moral orientation (r = .23, p = .01) meaning that those who scored higher on the BAS also showed a preference for a deontological/rule-based moral orientation, which is consistent with Lammers and Stapel (2009). The inconsistency between the moderated mediation and the correlational analysis is explained by the fact that while the positive correlation exists for the whole sample, when the data are split by object, the positive correlation is only observed for those in the Student ID condition (r = .32, p = .00) but not for those in the smartphone condition (r = .08, p = .48).

A significant negative correlation was also observed between BIS and amount wagered (r = -.20, p = .01). This is theoretically consistent with the BAS/BIS theory of psychological power (Keltner, et al., 2003). Thus, the results are somewhat mixed as to how valid and sensitive the Carver and White (1994) BIS/BAS scales were as a measures of psychological power in Study 1. This will be discussed in greater detail in Chapter 7.

While it was unexpected, and of little theoretical relevance to the current project, the significant main effect of order on risk taking is interesting. Specifically, participants that wagered slightly later during the experimental session (in the moral orientation first condition) wagered significantly more than those that wagered approximately one minute earlier (in the risk-taking first condition). Because the double-or-nothing game was held just after participant material packets were collected, those in the moral orientation first condition wagered temporally closer to the double-or-nothing game (i.e., the opportunity to earn additional compensation). It is possible that the closer temporal proximity of the actual opportunity to win cash activated the BAS in the moral orientation first condition where wagers were placed at the very end of the session thus causing people to be more

reward oriented and thus more willing to take risks. While not of central importance to the current hypotheses, this finding is certainly important to keep in mind in replication attempts when deciding on the order of procedures. In the current study, the effect of smartphone custody on BAS may have been nullified or in some cases even reversed by this influence of temporal proximity to the gambling activity thereby attenuating the ability to observe the impact of smartphone-induced power on risk taking.

As the same research question posed along with the predictions in this study is also posed for Study 2, both will be dealt with together in Chapter 6. The findings of this study will be discussed again along with those of Study 2 and supplementary analysis in Chapter 7, the General Discussion.

CHAPTER V

STUDY 2

Study 2 was intended to test the same basic thesis as was tested in Study 1; that access one one's smartphone increases feelings of psychological power, and that this effect is moderated by one's level of smartphone psychological ownership (SPO). Study 2 specifically investigated whether the presence of a person's smartphone increased the likelihood that he or she would commit an immoral act. In this study, the immoral act in question was the decision to cheat in order to obtain more raffle entries.

High levels of psychological power activate the BAS and so increase the focus on gains and rewards, while low levels of psychological power activate the BIS and increase the focus on loss and punishment (Keltner, et al., 2003). Accordingly, previous research has found that high power is associated with increased likelihood to steal (Yap et al., 2013) and cheat (Lammers et al, 2010). Thus, it was predicted that if access to one's smartphone increased feelings of psychological power, participants in the smartphone access condition would cheat more than participants in the smartphone deprivation condition. The following specific predictions were made:

- Hypothesis 7[22]: A significant object-by-custody interaction is predicted such that compared with those in the smartphone deprivation condition, those in the smartphone access condition will exhibit more psychological power as measured using the BIS/BAS Scales. No such difference is expected in the student ID condition.
- Hypothesis 8: A significant object-by-custody interaction is predicted such that compared with those in the smartphone deprivation condition, those in the smartphone access condition will exhibit more cheating behavior as measured by the number of reported raffle entries won. No such difference is expected in the student ID condition.
- Hypothesis 9: Psychological power will mediate the effect of smartphone custody on cheating.
- Hypothesis 10[23]: Smartphone psychological ownership will moderate the effect of smartphone custody on psychological power such that those with higher levels of smartphone psychological ownership will be more affected by the custody manipulation, and those with lower levels of smartphone psychological ownership will be less affected by the custody manipulation.
- Research Question: Does the relationship between smartphone psychological ownership and psychological power differ depending on the route by which those feelings developed or the motives served by those feelings?[24]

[22] Same prediction as is made in Hypothesis 1.
[23] Same prediction as is made in Hypothesis 6 of Study 1.
[24] This question will not be addressed in the current chapter, but will be given detailed attention in Chapter 6.

Method

Design and Participants

This study employed a 2 (custody: access vs. deprivation) by 2 (object: smartphone vs. student ID) between-subjects design. The primary dependent measure of interest was cheating. Cheating was operationally defined as the decision to over-report the number of raffle entries earned by rolling a pair of dice. Again the Carver and White (1994) BIS/BAS Scales were used to measure psychological power.

Data were collected from 75[25] undergraduate students enrolled in an introductory psychology course (e.g., PSYC100 or PSYC101) at Loyola University Chicago. They were recruited using the Sona-System, and received partial course credit toward a course requirement for their participation. Recruitment text indicated that participants must be fluent English speakers who currently owned and used a smartphone. In addition to their experimental credits, they were given the opportunity to enter a raffle for a chance to win one of two $150.00 gift card prizes.

Procedure

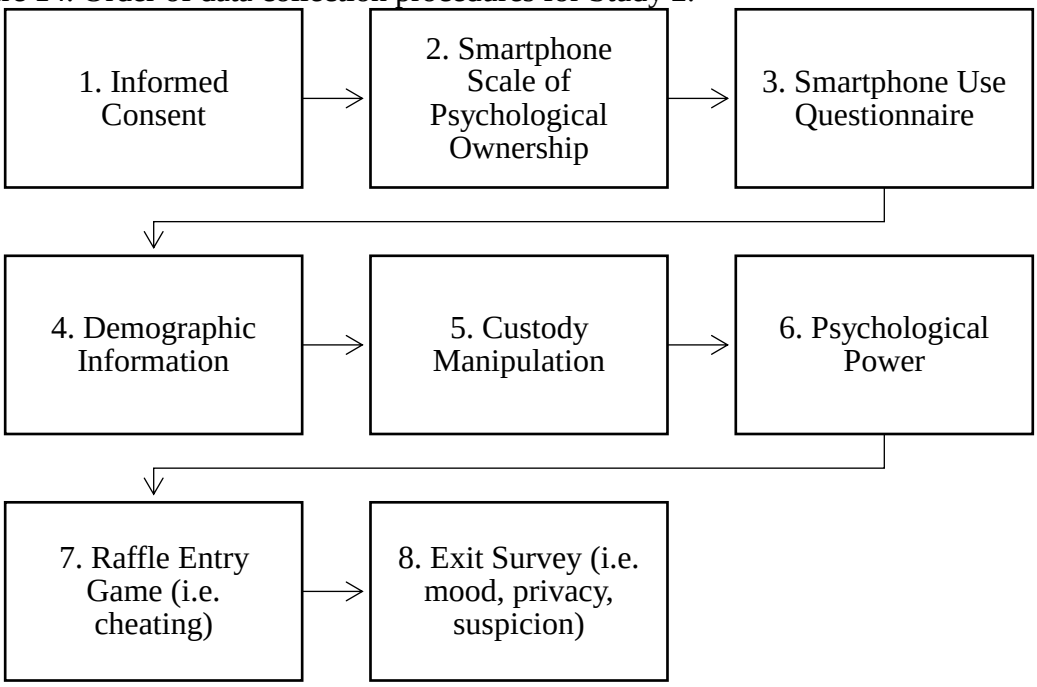
As in Study 1, participants were run simultaneously in small groups. However, the nature of the dependent measure of cheating also required privacy. Thus, desktop privacy boards were used to separate participants' workspaces (see Appendix E for an image of the privacy boards used).

Depending on the session date, participants blindly self-selected into either the smartphone or student ID condition. Random assignment to a custody condition was

[25] Originally there were 76 participants but again one participant that had been run alone due to a "new show" was excluded from the sample.

accomplished by randomly distributing the two versions of a paper-and-pencil data collection material packet, as was done in Study 1. Data collection proceeded as depicted in Figure 14 (below).

Figure 14. Order of data collection procedures for Study 2.



As with Study 1, order of procedures was determined by the paper-and-pencil participant material packet. Experimenters followed a script to walk participants through the session section-by-section at the same pace. Verbal and written instructions accompanied each section.

Written, informed consent was collected from each participant. Next, participants completed the measure of SPO followed by the smartphone use questionnaire and demographic information (both basic and smartphone). Then, the custody manipulation was accomplished exactly as it was described in Study 1. Participants read, "During the next part of the experiment, you will be asked for a piece of information that you will be

[*required to obtain* (access condition)]/[*tempted to obtain, but not permitted to obtain* (deprivation condition)] from your [*smartphone*]/[*student ID*]." Based on condition assignment, they were asked either to put their smartphone/student ID on the desk in front of them (access condition), or to place it in a clear container, which was then placed on the experimenter's desk (deprivation condition).

Immediately following the custody manipulation, participants completed the measure of psychological power. Next, they completed the raffle ticket entry game by rolling a pair of dice and recording the number of entries won. Finally, participants completed an exit survey wherein they reported how much privacy they felt they had, completed a mood measure, and were probed for suspicion. Finally, they were thanked and dismissed. Partial debriefing[26] was accomplished via email after all data had been collected.

Materials

A complete set of materials used in Study 2 can be found in Appendix F. It is a full copy of the paper-and-pencil participant material packet used.

Manipulated predictors. There were two manipulated predictors, object (smartphone vs. student ID) and custody (access vs. deprivation). Both were manipulated exactly as was described for Study 1.

Measured predictor. There was one measured predictor, SPO, which was measured using the same scale described in detail for Study 1.

[26] The decision to only partially debrief subjects is explained below.

Psychological power. There were two primary dependent measures of interest. The first is psychological power, which was measured using the Carver and White (1994) BIS/BAS Scales described in detail for Study 1.

Cheating behavior. The second dependent measure was cheating behavior. Cheating was operationalized as the average number of raffle entries reportedly won. Participants were informed that a raffle would be held where they would have the chance to win one of two $150.00 gift cards and told that they would earn raffle entries by rolling a pair of dice. In reality, each participant received only one raffle entry. This minimal deception was necessary so as not to disadvantage participants who did not over-report the number of entries that they won.

During the raffle entry game, participants were instructed to roll a pair of 10-sided dice. One die was black and one was white. A form was included in the participant material packet that included step-by-step instructions for completing the raffle entry game. Two blank spaces were provided on the form in which participants were to record the numbers rolled. The first spaced was labeled "tens" and was located on the left. The second space was labeled "ones" and was located on the right. Together they were used to record the two-digit number of the participant's number of raffle entries. Participants were told to roll the white die and to record the number rolled in the "ones" place on the right and then to roll the black die and record the number rolled using that die in the "tens" place on the left.

Each die was labeled with the numbers zero through nine. Thus participants could earn anywhere from 0 raffle entry (if 2 zeros were rolled) up to 99 raffle entries (if 2 nines were rolled). The average number of entries earned by rolling the pair of dice

should be 49.5[27]. Participants in the smartphone access condition were expected to be more likely to cheat in which case the average number of reported raffle entries won was expected to be higher than 49.5 entries in that condition. These procedures are consistent with those used by Lammers et al. (2010) in Study 1.

Demographics. The same basic and smartphone demographic questions were used for Study 2 as were for Study 1.

Exit survey. Study 2 employed the same exit survey as was used in Study 1 with one exception. Both the mood measure and hypothesis guess items were the same as in Study 1. However, because the measure of cheating behavior required privacy, there was a single *privacy item* embedded in a series of questions in the exit survey. This was included to check whether the privacy boards successfully provided sufficient privacy to allow participants to cheat. Participants read the following: "Data collection sessions are run in various rooms. To assess the suitability of different rooms for data collection, please provide some feedback regarding the room that you completed your experiment in today by indicating how strongly you agree with each of the statements below." In addition to the privacy item, they were asked about how quiet the room was, how well-lit it was, and whether they experienced many distractions during the experiment. The privacy item specifically asked participants how strongly they agreed with the following statement: "I had complete privacy during the experiment." Participants responded on a scale of one to four where higher values represent stronger agreement with the statement.

[27] 0 + 99 / 2 = 49.5

The same criteria for determining whether a hypothesis guess was "not close", "close", or "accurate" was used in Study 2 as was described for Study 1. Again, the majority of hypothesis guesses were not close (73%). Only 17 guesses were coded as "close" (23%) and only 3 were coded as "accurate" (4%) (see Table 11 below). In general, guesses tended to be vague and in line with the cover store.

Table 11. Accuracy of hypothesis guesses by condition.

		Object	
Custody	**Guess Accuracy**	**Smartphone**	**Student ID**
Access	*Not Close*	15	17
	Close	9	3
	Accurate	1	1
Deprivation	*Not Close*	12	11
	Close	3	2
	Accurate	0	1

The same question asking participant to report either the number of apps installed on their smartphone (smartphone condition) or the clothing that they were wearing in their student ID (student ID condition) that was used in Study 1 was included for the same reason in Study 2.

Debriefing. Partial debriefing was accomplished via an email sent to all participants at the end of data collection. Participants were made aware of the general hypothesis that smartphone access increases psychological power. However, they were not made aware that the raffle entry task served as a dependent measure of cheating behavior. This decision was made based on a recommendation made by a member of the Loyola Institutional Review Board (IRB) who suggested that the only harm that may come to participants as a result of this study is the knowledge that their immoral behavior may have been known to the experimenter. In other words, if a participant did choose to cheat by over-reporting the number of raffle entries won, and they were made aware

through the debriefing that the experimenter likely knew of their cheating, they may experience distress that they would not have had that information not been provided. The text used in the debriefing email can be found in Appendix G.

Results

All data was collected during the Spring 2016 semester. A total of 75 undergraduates (Male = 29, Female = 46) took part in Study 2. Participants were typical college age (M = 19.35, SD = 1.39) that reported having gotten their first smartphone around the age of 15 (M = 14.79, SD = 2.13) meaning that on average participants had owned/used a smartphone for about 4.5 years (M = 4.54, SD = 1.90). The majority reported having an Apple iPhone (85.3%). Participants reported having had their current device on average for a little less than a year (M = 10.76, SD = 9.75). They also reported that their current device worked well (M = 8.27, SD = 1.45) and that they were satisfied with it (M = 8.61, SD = 1.71)[28].

Sessions ranged in size from 2 to 7 participants (M = 5.11, SD = 1.65). The most common session size was seven participants (26.7%). At the close of data collection, it appeared that cell sizes had been kept fairly balanced; however, upon closer inspection, it was discovered that one session in which student ID custody was supposed to have been manipulated, due to experimenter error, smartphone custody was actually manipulated. This resulted in more smartphone observations than student ID observations. Table 12 below depicts the number of observations made per condition.

[28] Both on a 10-point scale where higher numbers indicate greater functionality/satisfaction.

Table 12. Number of observations per condition in Study 2.

Custody	Object	
	Student ID	Smartphone
Access	15	25
Deprivation	14	21

Preliminary Analysis

Missing data. For each scale or variable, the percent of missing data is reported and then the method for dealing with the missing data points is explained.

For the scale of SPO, there were 75 participants and 18 items on the scale resulting in 1,350 data points. Of those, only 3 were missing (0.22%). Each missing value was from a different participant and each was from a different scale item. Thus, missing values appeared to be completely at random rather than systematic. Missing values were replaced with the mean of the item average and the participant's average for the rest of the items on the scale of SPO.

There were no missing values on the measure of smartphone use, smartphone make/model, or for the remainder of the smartphone demographics (age at which participant first got a smartphone, how many months they had owned their current device, how well their current device functioned and how satisfied they are with it). All participants also reported their age and gender.

As was described above for Study 1, the measure of BAS is divided into three subscales (Drive, Reward Responsiveness and Fun Seeking). For the Drive subscale, there were 4 items resulting in 300 data points. Two values were missing (0.66%). As was the case in Study 1, both of the missing values were on the fourth Drive subscale

item[29] that appeared as the first item on the BIS/BAS questionnaire. Thus, the missing values may not be completely at random; however, due to the very low percentage of missing values it was decided that it was appropriate to replace the values. Thus, the same imputation was used to replace these missing values as was described above (using the mean of the item mean and participant's subscale mean).

There was only one missing value (0.26%) for the five-item Reward Responsiveness subscale of the BAS. The same imputation described above was used to replace this missing data point. No missing values were observed on either the Fun Seeking subscale of the BAS or on the BIS subscale. No missing values were observed on the raffle entry game (i.e., DV of cheating behavior), on any of the items associated with the mood check, or on any of the items associated with the privacy check.

Thus of the 5,320 data points checked, only 6 were missing (0.11%) and all were replaced using the imputation described above.

Reliability, validity, and variable creation. For each of the scales or variables discussed below, where applicable, missing values were replaced before internal consistency reliability was obtained.

Smartphone psychological ownership. After reverse scoring items 5 and 9, Cronbach's alpha for all 18 items measuring SPO was acceptable ($\alpha = .87$). By removing reverse scored item number 5, alpha could be increase to .88, but as this was a very small improvement to an already reliable scale, and to be consistent in the items included on the

[29] This item asked participants the extent to which they agreed with the statement, "When I go after something, I use a 'no holds barred' approach." It is possible that some participants were not familiar with this figure of speech, especially if they were not native English speakers, and did not respond for that reason.

scales used in Studies 1 and 2, all 18 items were included in the average of SPO (M = 4.09, SD = 0.77).

Theoretically, this measure may be expected to correlate with average use, smartphone tenure (how long an individual has been a smartphone owner/use), how many months a participant had owned the current device, how well the device functions and how satisfied they are with their current device. To estimate the validity of this measure, correlations were checked between the abovementioned variables and SPO. As anticipated, positive correlations were observed among SPO and average use (r = .47, p = .00) and how many months they had owned their current device (r = .26, p = .02). However, unlike Study 1, the anticipated positive correlations were not observed between SPO and smartphone tenure (r = .03, p = .81), functionality (r = .08, p = .50), and satisfaction (r = .05, p = .68). Average smartphone use does not correlate with any of the other variables included in the analysis suggesting that the measure of SPO, while related to use, is distinct from average use.

Smartphone use. The original Cronbach's alpha obtained for the 13 item measure of smartphone use was reliable (α = .74). While reliability could be improved slightly by removing some items, in order to keep measures the same across both studies, and because original reliability was above the acceptable threshold of .70, average smartphone usage (M = 3.66, SD = 0.57) was created using all 13 of the items.

BIS/BAS. For the same reasons discussed in Chapter 4, the BIS/BAS scale was treated as a two-factor scale with all three BAS subscales treated as a single factor (see Table 13, below).

Table 13. Comparison of two-factor to four-factor treatment of BIS/BAS scale.

		Four-Factor			Two-Factor		
		Alpha[a]	Skew[b]	Kurtosis	Alpha	Skew	Kurtosis
BIS		.75	-.59	.18	.75	-.59	.18
BAS	Drive	.76	-.21	-.27	.78	-.25	-.58
	Reward Resp.	.75	-.98	.34			
	Fun Seeking	.58	-.28	-.22			

[a]Chronbach's alpha.
[b]Skewness and kurtosis scores reflect values produced before any outliers were removed or transformations were performed.

Again in Study 2, as in Study 1, treating the BIS/BAS scale as a two- rather than a four-factor scale corrects the low internal consistency reliability observed on the Fun Seeking subscales and also reduced the skewness observed on the Reward Responsiveness subscale without greatly increasing the skewness observed on the other two BAS subscales. Average BIS and average BAS were not correlated. Unlike in Study 1, average BAS was not significantly correlated with positive emotion (r = .15, p = .20), and BIS was not significantly correlated with negative emotion (r = -.11, p = .37). Regardless, the two-factor treatment appears superior to the four and will be adopted again for Study 2.

After reverse scoring items 5 and 7, Cronbach's alpha for the 7 item BIS subscale was acceptable (α = .75) and could not be further improved by removing any items. Thus, average BIS (M = 3.02, SD = 0.52) was calculated using all seven items. Cronbach's alpha for the 13 items of three combined BAS subscales produced an alpha of .77 and could be improved slightly by removing some items however because initial reliability was above the .70 acceptable threshold and to keep measures the same in Studies 1 and 2, no items were removed. Thus average BAS (M = 3.17, SD = 0.34) was calculated using all 13 items.

Privacy check. Responses to the privacy check item indicate that indeed, participants felt that they had privacy (M = 3.69, SD = 0.62) with the vast majority (94.7%) reporting either a 3 (18.70%) or a 4 (76.00%) out of a four-point response scale on this item.

Mood measure. Participants were asked the extent to which "today's experiment caused you to feel each of the following emotions". In general, on a five-point scale where higher numbers indicate stronger feelings, participants did not report a strong emotional reaction on any of the six emotions: happy (M = 2.45, SD = 1.57), excited (M = 2.31, SD = 1.67), peaceful (M = 2.44, SD = 1.72), angry (M = 0.29, SD = 0.79), sad (M = 0.33, SD = 0.89), or anxious (M = 0.79, SD = 1.14). The positive (happy, excited, and peaceful) (M = 2.40, SD = 1.42) and negative (angry, sad, and anxious) emotions (M = 0.47, SD = 0.76) were separately averaged and then the average of the negative items was subtracted from the average of the positive items to create an overall mood index (M = 1.93, SD = 1.54) where higher numbers indicate a more positive mood in response to the experiment.

Check for normality and extreme cases. For each of the measures discussed below statistics for skewness and kurtosis were obtained and both histograms and P-P plots were visually inspected to test for violations to assumptions of normality. As in Study 1, and following the recommendation of Fields (2009), skewness and kurtosis scores were converted to z-scores using the equations $Z_{skewness} = S - 0 / SE_{skewness}$ and $Z_{kurtosis} = K - 0 / SE_{kurtosis}$ respectively. Based on sample size, Field (2009) suggests different z-score cut-off values. Thus, based on the sample sizes in Study 2, a z-score with an absolute value greater than 1.96 (significant at the $p < .05$ level) was considered

to significantly deviate from normal (also based on the recommendation of Field, 2009)[30]. Kolmogorov-Smirnov with a Lilliefors correction (K-S/Lilliefors) was also performed to see whether levels of skewness were significant. Again, as in Study 1, visual inspection was used along with z-scores and K-S/Lilliefors in making judgments regarding whether or not to transform variables.

Average smartphone psychological ownership. Average SPO produced a normal distribution with a skewness of .02 (*SE* = .28, z-score = 0.07) and a kurtosis of -.72 (*SE* = .55, z-score = -1.31). The K-S/Lilliefors test [$D(75) = .06$, $p = .20$] indicated that the distribution is not significantly different from normal. Visual inspection of the box-and-whisker plot revealed no potential outliers. No correction was performed for this variable.

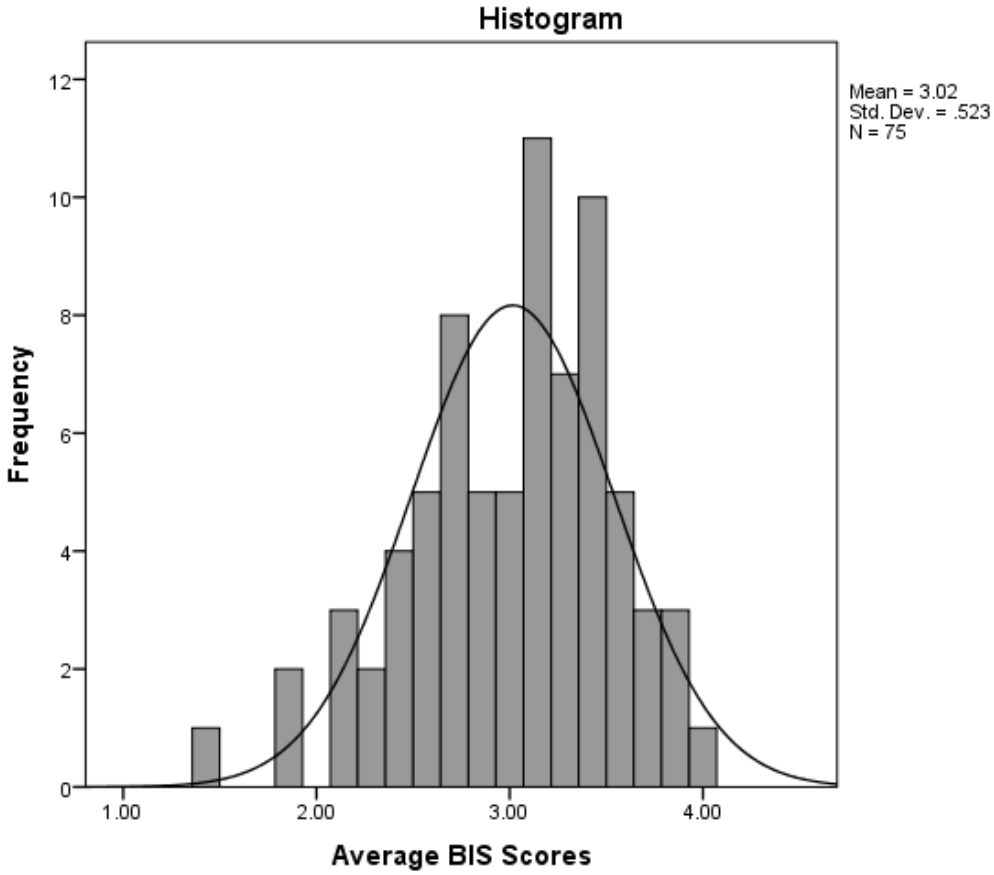
Average smartphone use. Average smartphone use produced a distribution with a skewness of -.27 (*SE* = .28, z-score = -0.96) and a kurtosis of -.77 (*SE* = .55, z-score = 1.40). The K-S/Lilliefors test [$D(75) = .10$, $p = .09$] indicated that the distribution is not significantly different from normal. Visual inspection of a box-and-whisker plot revealed no potential outliers. No correction was performed for this variable.

BIS/BAS. Average BIS produced a negatively skewed distribution with a skewness of -.57 (*SE* = .28, z-score = -2.04) and a kurtosis of .19 (*SE* = .55, z-score = 0.35). The K-S/Lilliefors test [$D(75) = .13$, $p = .003$] indicated that the distribution was significantly negatively skewed (see Figure 15, below). Visual inspection of the box-and-whisker plot revealed one fringelier that was -3.04 standard deviations below the

[30] This different, lower z-score cut off reflects the smaller sample used in Study 2 compared with Study 1 and is the cut-off recommended by Field (2009).

mean. Looking at that participant's responses on other items, he did not appear to be an outlier on any other variables. Thus, the decision was made to retain the fringelier and no correction was made to this variable. This decision was also made in part to ensure that the measure of BIS used in Studies 1 and 2 was the same.

Figure 15. Frequency distribution of average BIS scores.



Average BAS produced a distribution with a skewness of -.17 (*SE* = .28, z-score = 0.61) and a kurtosis of -.45 (*SE* = .55, z-score = -0.82). The K-S/Lilliefors test [*D*(75) = .10, *p* = .06] indicated that the distribution was not significantly different from normal. Visual inspection of the box-and-whisker plot revealed no potential outliers. No correction was made to this variable.

Raffle entries. The number of raffle entries reportedly won produced a negatively skewed distribution with a skewness of -.52 (*SE* = .28, z-score = -1.86) and a kurtosis of -.95 (*SE* = .55, z-score = -1.74). Neither z-score exceeded the 1.96 threshold suggesting significant deviation from normality. However, the K-S/Lilliefors test [$D(75) = .11$, $p = .03$] indicated that the distribution was significantly negatively skewed. This was anticipated given that this is a measure of cheating behavior. The absence of cheating would have yielded a perfectly normal distribution. The fact that the distribution is significantly negatively skewed may suggests that participants tended to over-report the number of raffle entries won by rolling the dice. Visual inspection of a box-and-whisker plot revealed no potential outliers, and no correction was performed for this variable.

Effects on mood and privacy. A 2 (custody: access vs. deprivation) by 2 (object: smartphone vs. student ID) multivariate analysis of variance (MANOVA) was done to test for effects on amount of perceived privacy and mood effects of the experiment (using the overall mood index). No effects were expected and none were observed. There was no main effect of custody on perceived privacy [$F(1, 74) = 0.16$, $p = .69$, $\eta^2_p = .00$] or on mood [$F(1, 74) = 0.01$, $p = .92$, $\eta^2_p = .00$]. There was no main effect of object on perceived privacy [$F(1, 74) = 0.13$, $p = .72$, $\eta^2_p = .00$] or on mood [$F(1, 74) = 0.01$, $p = .91$, $\eta^2_p = .00$]. There were no two-way object-by-custody interactions on either perceived privacy [$F(1, 74) = 0.08$, $p = .78$, $\eta^2_p = .00$] or mood [$F(1, 74) = 1.39$, $p = .24$, $\eta^2_p = .02$].

Detection of covariates. Correlational analyses were run to see whether significant correlations existed between any of the outcome measures (entries reportedly

won, average BIS, average BAS), and any of the following possible extraneous factors: session size (i.e., number of participants in a given data collection session), participant age, age at which participant got a smartphone, smartphone tenure (how many years a participant has been a smartphone owner/user), number of months current device has been owned, smartphone functionality, smartphone satisfaction, and mood [see Table 14, below]. The following significant correlations were detected. Average BAS was negatively correlated with participant age (r = -.23, p = .05) such that younger participants reported higher levels of BAS. Also, average BAS was positively correlated with smartphone satisfaction (r = .27, p = .02) such that those who reported being more satisfied with their current smartphone also reported higher levels of BAS. Number of entries claimed was positively correlated with session size (r = .23, p = .05) such that those in larger sessions tended to report having earned more raffle entries. Number of entries claimed was also positively correlated with mood (r = .41, p = .00). Those that reported having earned more raffle entries, likely for that reason, also reported being in a more positive mood as a result of the experiment. Thus, age, smartphone satisfaction, session size, and mood were included as covariates in the regression analysis.

Table 14. Correlational analyses to detect possible covariates in Study 2.

Correlations												
		Average BAS	Average BIS	Raffle Entries	Session Size	Participant Age	Age First Got Smartphone	Smartphone Tenure	Months Owned Smartphone	Smartphone Functionality	Smartphone Satisfaction	Average Mood
Average BAS	Pearson Correlation	1	-.063	.181	.059	-.230*	-.046	-.108	-.028	.218	.270*	.178
	Sig. (2-tailed)		.592	.120	.613	.047	.694	.356	.810	.060	.019	.127
	N	75	75	75	75	75	75	75	75	75	75	75
Average BIS	Pearson Correlation	-.063	1	-.016	.052	-.090	-.110	.077	-.038	-.056	.052	.152
	Sig. (2-tailed)	.592		.891	.659	.444	.349	.511	.745	.633	.657	.193
	N	75	75	75	75	75	75	75	75	75	75	75
Raffle Entries	Pearson Correlation	.181	-.016	1	.232*	-.093	-.071	.030	.055	-.065	.083	.406**
	Sig. (2-tailed)	.120	.891		.045	.426	.542	.800	.640	.580	.479	.000
	N	75	75	75	75	75	75	75	75	75	75	75

*Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Main Analysis

To test the predicted object-by-custody interactions on power and cheating behavior a separate hierarchical simultaneous regression was conducted for each dependent variable. Hierarchical simultaneous regression was used rather than MANOVA so that the predicted moderation effect of SPO could be tested in the same analysis (since psychological ownership is being treated as a continuous predictor). Categorical predictors (i.e., custody, and object) were coded using effects coding [see Table 15, below]. The continuous predictor (SPO) was centered by subtracting the scale mean from each participants' score.

Table 15. Effects coding for categorical predictors.

Factor	Condition	Code
Custody	Access	1
	Deprivation	-1
Object	Smartphone	1
	Student ID	-1

Mood, participant age, smartphone satisfaction, and session size were all controlled for in Block 1 of the regression analyses based on the significant correlations observed. Block 2 tested the main effect of custody and object. Block 3 tested the interaction between custody and object. This served as the test of Hypotheses 7 and 8. Block 4 of the hierarchical simultaneous regression tested the moderating effect of SPO. Centered SPO was entered as a continuous predictor. Interaction terms were created between SPO and categorical predictors by multiplying the centered SPO variable with each the object and custody effects coded variables. Also a three-way interaction term was created for SPO, object, and custody. All of these predictors were entered into Block

4 of the regression model. The 3-way object-by-custody-by-SPO interaction term serves as the test of Hypothesis 10.

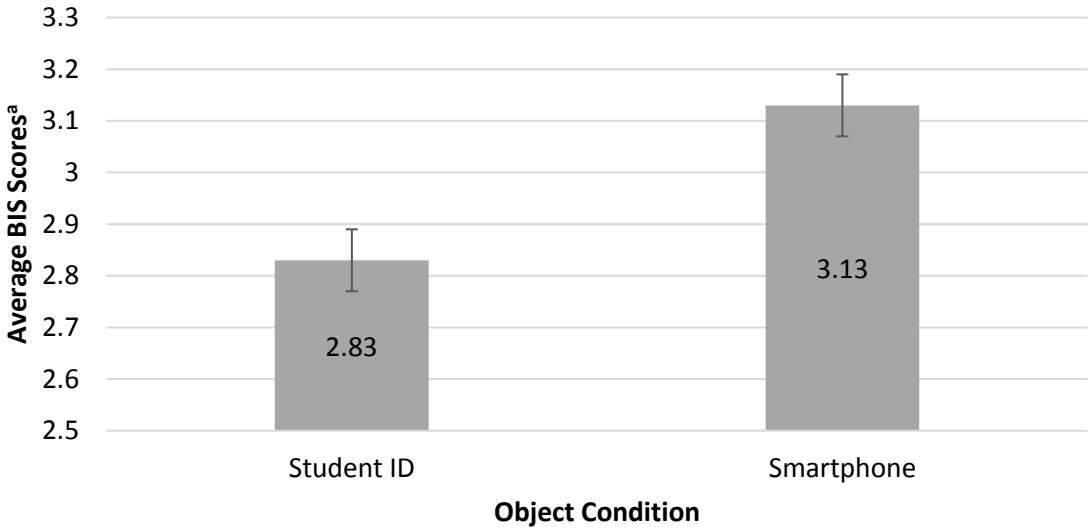
Psychological power. Recall that Hypothesis 7 predicted a significant object-by-custody interaction such that compared with those in the smartphone deprivation condition, those in the smartphone access condition would exhibit more psychological power as measured using the BIS/BAS Scales. No such difference was predicted in the student ID condition. Also, Hypothesis 10 predicted that SPO will moderate the effect of smartphone custody on psychological power, such that those with higher levels of SPO will be more affected by the custody manipulation, and those with lower levels of SPO will be less affected by the custody manipulation. Because there were two dependent measures of psychological power (BIS and BAS) two separate hierarchical simultaneous regressions were conducted, one for each dependent measure. Predictions regarding BIS (low power) will be labeled Hypothesis 7a and Hypothesis 10a while predictions regarding BAS (high power) will be labeled Hypothesis 7b and Hypothesis 10b. Both were conducted according to the procedures described above.

BIS. Block 1 of the hierarchical simultaneous regression revealed that the covariates accounted for 3.2% of variance [r^2 = .03, $F\Delta(4, 70) = .59$, $p = .68$] and none of the covariates significantly predicted BIS scores.

Block 2, which tested the main effects of custody and object accounted for 12.7% more variance in BIS scores [r^2 = .16, $F\Delta(2, 68) = 5.15$, $p = .01$]. No main effects had been predicted for custody and none was observed [$b = -.11$, $\beta = -.22$, $t(74) = -1.91$, $p = .06$] but an unexpected main effect of object was observed on BIS [$b = .18$, $\beta = .33$, $t(74)$

= 2.75, p = .01] indicating that those in the smartphone condition reported higher BIS scores than those in the student ID condition (see Figure 16, below).

Figure 16. Unexpected main effect of object on average BIS.



a. Error bars represent +/- 1 SE.[31]

Block 3, which tested the interaction between custody and object, only accounted for 0.7% more variance [r^2 = .17, $F\Delta(1, 67) = 0.57$, p = .45]. A significant two-way interaction had been predicted between object and custody (Hypothesis 7a), but was not observed [b = .05, β = .09, $t(74) = 0.76$, p = .45]. Thus Hypothesis 7a was not supported.

Block 4, which tested the moderating effects of SPO accounted for an additional 6.8% of variance in BIS scores [r^2 = .24, $F\Delta(4, 63) = 1.41$, p = .24]. No main effect of SPO on BIS scores was either predicted or observed [b = .08, β = .11, $t(74) = 0.88$, p = .38]. No significant two-way interactions had been predicted between SPO and object [b = .07, β = .10, $t(74) = 0.77$, p = .44] or custody [b = .14, β = .20, $t(74) = 1.64$, p = .11] and none was observed for either. A significant three-way interaction had been predicted

[31] SE = s/√W = .52335/√75 = .52335/8.66 = .06

between SPO, object, and custody (Hypothesis 10a), but no such interaction was observed [b = -.13, β = -.19, t(74) = -1.46, p = .15]. Thus Hypothesis 10a was not supported (see the coefficients in Table 16 below).

Table 16. Coefficients produced by the hierarchical simultaneous regression on BIS.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.416	1.124		3.039	.003
	Participant Age	-.032	.049	-.084	-.642	.523
	Session Size	.017	.038	.054	.452	.653
	SP Satisfaction	.003	.039	.011	.082	.935
	Average Mood	.048	.040	.141	1.195	.236
2	(Constant)	2.367	1.112		2.128	.037
	Participant Age	.011	.048	.029	.228	.820
	Session Size	-.015	.037	-.047	-.401	.690
	SP Satisfaction	.045	.040	.147	1.141	.258
	Average Mood	.047	.038	.137	1.223	.226
	Custody	-.114	.060	-.218	-1.910	.060
	Object	.177	.064	.332	2.753	.008
3	(Constant)	2.434	1.120		2.174	.033
	Participant Age	.009	.049	.023	.180	.858
	Session Size	-.014	.037	-.043	-.368	.714
	SP Satisfaction	.041	.040	.133	1.016	.313
	Average Mood	.051	.039	.149	1.315	.193
	Custody	-.123	.061	-.235	-2.015	.048
	Object	.172	.065	.322	2.653	.010
	Custody-by-Object	.046	.061	.088	.756	.452
4	(Constant)	2.680	1.132		2.367	.021
	Participant Age	-.005	.050	-.014	-.104	.918
	Session Size	.009	.039	.029	.234	.816
	SP Satisfaction	.035	.041	.116	.871	.387
	Average Mood	.027	.040	.078	.667	.507
	Custody	-.103	.061	-.198	-1.689	.096
	Object	.161	.066	.302	2.458	.017
	Custody-by-Object	.057	.061	.110	.937	.352
	Average SPO	.075	.086	.111	.881	.382
	Custody-by-SPO	.138	.084	.201	1.638	.106
	Object-by-SPO	.066	.085	.097	.771	.443
	Three Way	-.131	.090	-.191	-1.462	.149

a. Dependent Variable: Average BIS

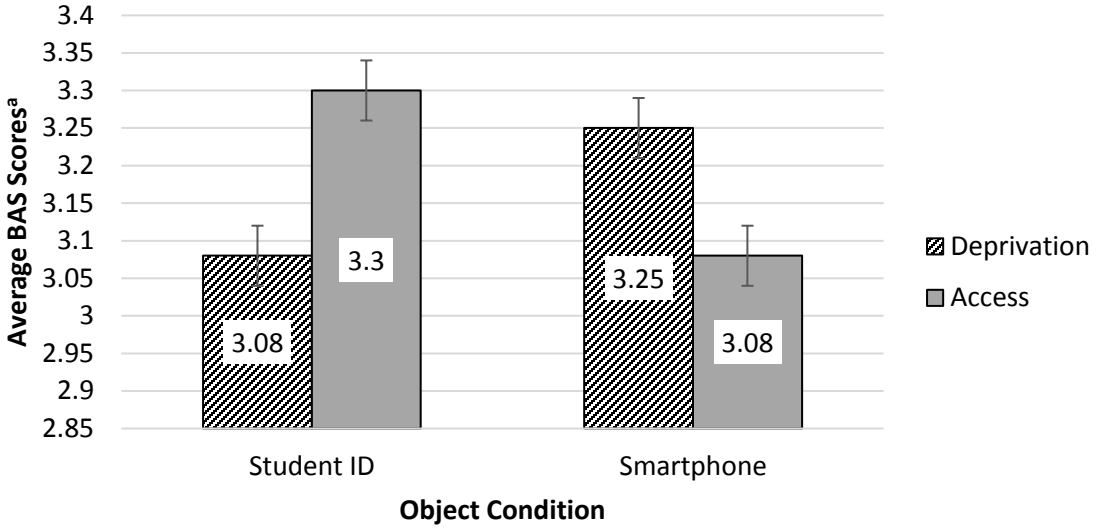
Legend: Average BIS = average BIS score, Participant Age = participant's biological age, Session Size = number of participants in the session, SP Satisfaction = participant's level of satisfaction with his/her current device, Average Mood = average of all mood check items, Custody = Effects coded custody categorical predictor, Object = Effects coded object categorical predictor, Custody-by-Object = object-by-custody interaction, Average SPO = centered average SPO, Custody-by-SPO = custody-by-SPO interaction, Object-by-SPO = object-by-SPO interaction, Three Way = object-by-custody-by-SPO three-way interaction.

BAS. Block 1 of the hierarchical simultaneous regression revealed that collectively the covariates accounted for 12.00% of variance [r^2 = .12, $F\Delta(4, 70) = 2.38$, p = .06], however, individually none significantly predicted BAS scores.

Block 2, which tested the main effects of custody and object, only accounted for 0.1% more variance in BAS scores [r^2 = .12, $F\Delta(2, 68) = 0.03$, p = .97]. No main effects had been predicted for either and none was observed for custody [b = -.00, β = -.01, $t(74)$ = -0.89, p = .93] or object [b = -.01, β = -.03, $t(74) = -0.22$, p = .83].

Block 3, which tested the interaction between custody and object accounted for 8% more variance [r^2 = .20, $F\Delta(1, 67) = 6.68$, p = .01]. A significant two-way object-by-custody interaction had been predicted (Hypothesis 7b) and was observed [b = -.10, β = -.30, $t(74) = -2.58$, p = .01]. While this significant interaction would seem to lend support for Hypothesis 7b, the direction was actually opposite that which was predicted. Specifically, in the smartphone condition, those in the deprivation condition reported higher levels of BAS than those in the access condition. However, in the student ID condition, those in the deprivation condition reported lower levels of BAS than those in the access condition (see Figure 17, below).

Figure 17. Significant object-by-custody two-way interaction on BAS.

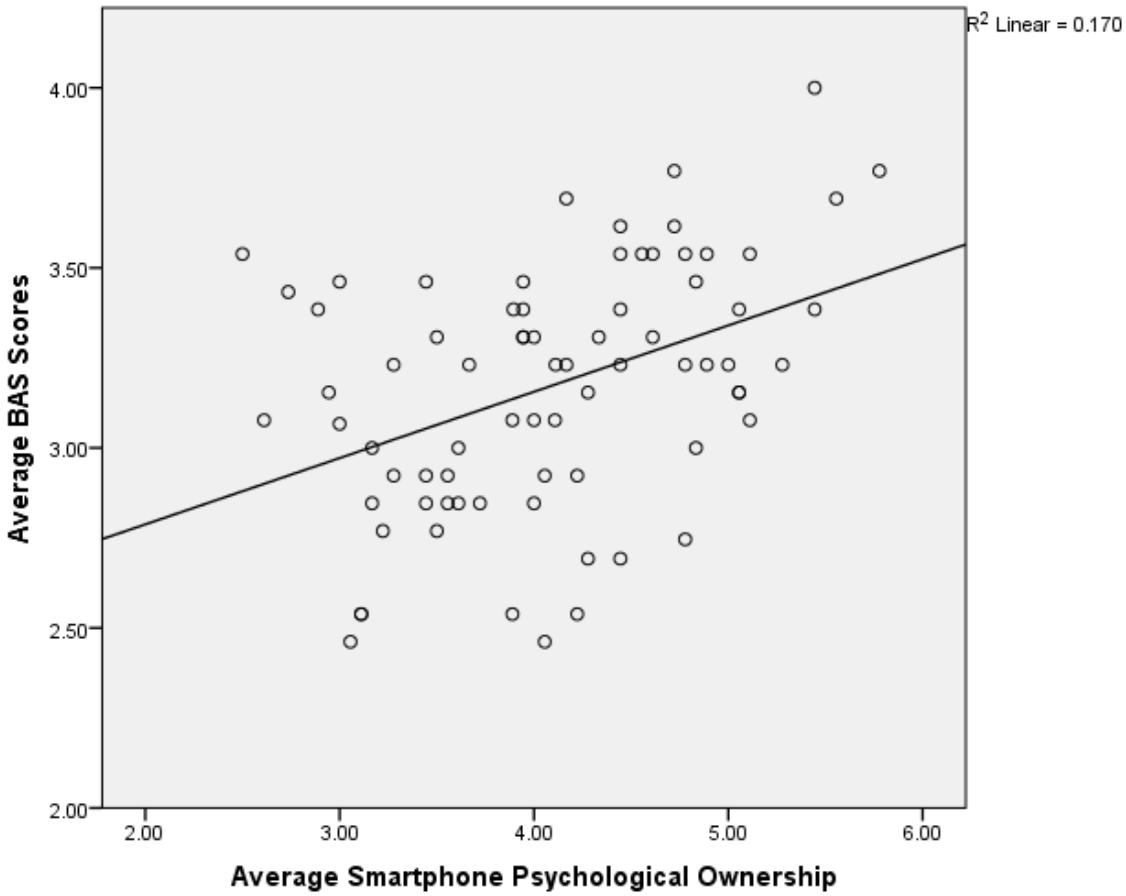


a. Error bars represent +/1 SE.[32]

Block 4, which tested the moderating effects of SPO accounted for an additional 13.7% of variance in BAS scores [r^2 = .34, $F\Delta(4, 63) = 3.25$, p = .02]. There was an unexpected significant main effect of SPO on BAS scores [b = .19, β = .42, $t(74) = 3.57$, p = .001] indicating that those who reported higher levels of SPO also scored higher on the BAS scale (see Figure 18, below).

[32] SE = s/√W = .344/√75 = .344/8.66 = .04

Figure 18. Scatterplot depicting unexpected main effect of smartphone psychological ownership on BAS.



No significant two-way interaction had been predicted between SPO and object [b = -.06, β = -.12, t(74) = -1.06, p = .30] or custody [b = -.05, β = -.11, t(74) = -0.92, p = .36] and none was observed for either. A significant three-way object-by-custody-by-SPO interaction had been predicted on BAS (Hypothesis 10b), but no such interaction was observed [b = .03, β = .06, t(74) = 0.47, p = .64]. Thus, Hypothesis 10b was not supported (see the coefficients in Table 17 below).

Table 17. Coefficients produced by the hierarchical simultaneous regression on BAS.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.390	.705		4.807	.000
	Participant Age	-.037	.031	-.149	-1.198	.235
	Session Size	.016	.024	.075	.661	.511
	SP Satisfaction	.041	.025	.202	1.649	.104
	Average Mood	.033	.025	.149	1.322	.190
2	(Constant)	3.416	.748		4.565	.000
	Participant Age	-.038	.032	-.152	-1.162	.249
	Session Size	.017	.025	.081	.674	.503
	SP Satisfaction	.039	.027	.195	1.475	.145
	Average Mood	.033	.026	.149	1.299	.198
	Custody	-.003	.040	-.010	-.085	.933
	Object	-.010	.043	-.027	-.221	.825
3	(Constant)	3.267	.721		4.530	.000
	Participant Age	-.033	.031	-.132	-1.048	.298
	Session Size	.014	.024	.069	.596	.553
	SP Satisfaction	.049	.026	.243	1.894	.063
	Average Mood	.024	.025	.108	.969	.336
	Custody	.016	.039	.048	.418	.678
	Object	.001	.042	.004	.035	.972
	Custody-by-Object	-.101	.039	-.296	-2.584	.012
4	(Constant)	3.043	.693		4.390	.000
	Participant Age	-.023	.030	-.091	-.742	.461
	Session Size	.021	.024	.102	.898	.372
	SP Satisfaction	.051	.025	.253	2.052	.044
	Average Mood	.009	.024	.041	.378	.707
	Custody	.027	.037	.079	.723	.472
	Object	-.003	.040	-.009	-.075	.940
	Custody-by-Object	-.090	.037	-.263	-2.416	.019
	Average SPO	.187	.052	.419	3.568	.001
	Custody-by-SPO	-.048	.052	-.105	-.919	.362
	Object-by-SPO	-.055	.052	-.123	-1.055	.296
	Three Way	.026	.055	.058	.474	.637

a. Dependent Variable: Average BAS

Legend: Average BAS = average BAS score, Participant Age = participant's biological age, Session Size = number of participants in the session, SP Satisfaction = participant's level of satisfaction with his/her current device, Average Mood = average of all mood check items, Custody = Effects coded custody categorical predictor, Object = Effects coded object categorical predictor, Custody-by-Object = object-by-custody interaction, Average SPO = centered average SPO, Custody-by-SPO = custody-by-SPO interaction, Object-by-SPO = object-by-SPO interaction, Three Way = object-by-custody-by-SPO three-way interaction.

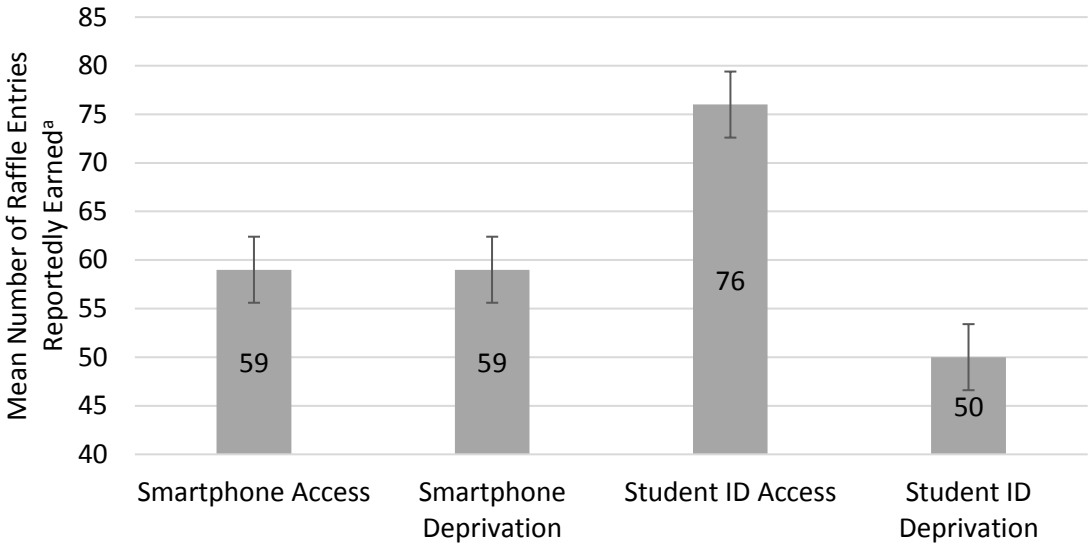
Cheating. Recall that Hypothesis 8 predicted a significant object-by-custody interaction on cheating behavior such that compared with those in the smartphone deprivation condition, those in the smartphone access condition would exhibit more cheating behavior as measured by the number of raffle entries reportedly won. No such difference was expected in the student ID condition.

First, to determine whether any cheating had taken place in the study (by over-reporting the number of raffle entries reportedly won), the average number of entries reportedly won was compared to the anticipated mean of 49.5 entries (if no cheating had taken place) using a one-sample sample t-test. This test confirmed that the observed mean of entries reportedly won (M = 60.76, SD = 29.48) was significantly higher than the mean anticipated by chance if no cheating had occurred (M = 49.50) [$t(74) = 3.31$, p = .001].

Next, a series of one-sample t-tests was done comparing each group mean to the expected mean of 49.5. This series of tests revealed that the mean in the smartphone access condition (M = 58.76, SD = 28.33) did not significantly differ from 49.50 [$t(24) = 1.64$, p = .12] providing no evidence that those in smartphone access condition cheated. The mean in the smartphone deprivation condition (M = 59.29, SD = 27.38) did not significantly differ from 49.50 [$t(20) = 1.64$, p = .12] providing no evidence that those in the smartphone deprivation condition cheated. The mean in the student ID access condition (M = 75.87, SD = 29.18) did significantly differ in an upward direction from 49.50 [$t(14) = 3.50$, p = .004] providing evidence that those in the student ID access condition did cheat. Finally, the mean in the student ID deprivation condition (M = 50.36, SD = 31.70) did not significantly differ from 49.50 [$t(13) = 0.10$, p = .92]

providing no evidence that hose in the student ID deprivation condition cheated. Thus evidence of cheating was only observed among those in the student ID access condition (see Figure 19, below).

Figure 19. Average of raffle entries reportedly won in the four conditions.



a. Error bars represent +/- 1 SE[33].

An ANOVA was conducted to test the main and interaction effects of custody and object on cheating. This test revealed no main effect of custody [$F(1, 74) = 3.32$, $p = .07$, $\eta^2_p = .05$], no main effect of object [$F(1, 74) = 0.36$, $p = .55$, $\eta^2_p = .01$], and no significant object-by-custody interaction [$F(1, 74) = 3.60$, $p = .06$, $\eta^2_p = .05$]. The only significant difference observed was between the student ID access and Student ID deprivation conditions ($p = .02$). Together, these results fail to provide support for Hypothesis 8. The only condition in which evidence of cheating was observed was in the student ID access condition, and the cheating was not significantly influenced by either the object or custody manipulations.

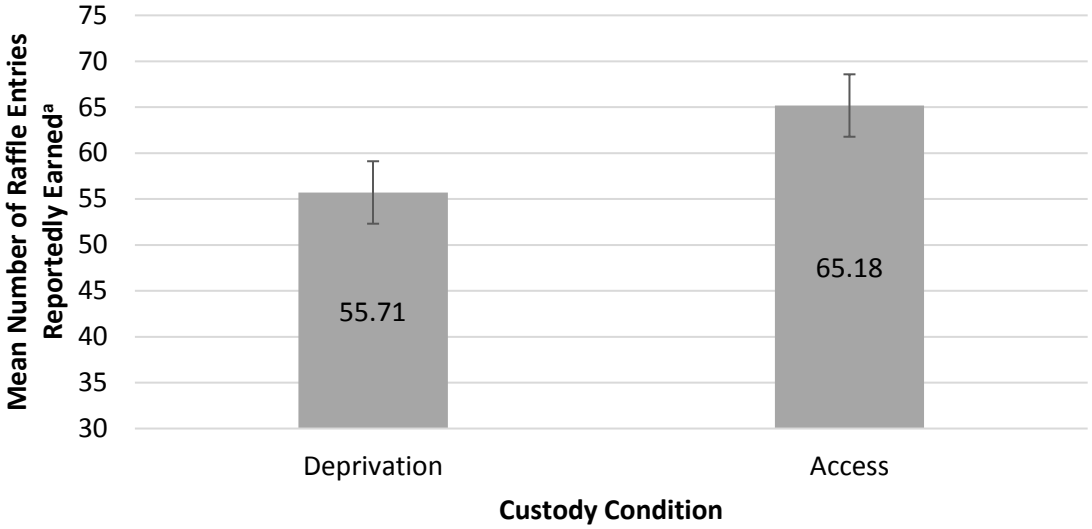
[33] SE = s/√W = 29.48/√75 = 29.480/8.66 = 3.40

While the above analysis serves as a valid test of Hypothesis 8, it does not test the possible moderating role of SPO. To determine what role SPO may have played in cheating behavior, the same hierarchical simultaneous regression used for BIS and BAS was also used for number of raffle entries reportedly won.

Block 1 of the hierarchical simultaneous regression revealed that the covariates accounted for 21.6% of variance [r^2 = .22, $F\Delta(4, 70) = 4.82$, p = .002]. Of the covariates tested, both session size [b = 3.90, β = .22, $t(74) = 2.03$, p = .05] and mood [b = 7.33, β = .38, $t(74) = 3.58$, p = .001] significantly predicted cheating behavior. Specifically, those in larger sessions tended to report having earned more entries (r = .23, p = .02) and those that reported being in a more positive mood (r = .41, p = .00) also reported having earned more raffle entries. It is possible that participating in a larger session indicated to participants that there was more competition for the prize, thus promoting greater cheating behavior.

Block 2, which tested the main effects of custody and object, accounted for 6.7% more variance in number of raffle entries reportedly won [r^2 = .28, $F\Delta(2, 68) = 3.15$, p = .05]. No main effects was predicted or observed for object [b = -4.96, β = -.17, $t(74)$ = -1.48, p = .14]. However, an unexpected main effect of custody [b = 6.70, β = .23, $t(74) = 2.16$, p = .03] was observed suggesting that those in the access condition reported having earned more raffle entries than those in the deprivation condition (see Figure 20, below). This is consistent with the results of the t-tests reported above, and would appear to be driven specifically by the high number of raffle entries reported by those in the student ID access condition, although no significant object-by-custody interaction was observed.

Figure 20. Unexpected main effect of custody on cheating.



a. Error bars represent +/- 1 SE.[34]

Block 3, which tested the interaction between custody and object accounted for 2.3% more variance [r^2 = .31, $F\Delta(1, 67) = 2.17$, p = .15]. A significant two-way object-by-custody interaction had been predicted (Hypothesis 8b) but was not observed [b = -4.62, β = -.16, $t(74) = -1.47$, p = .15]. Thus, Hypothesis 8b was not supported.

Block 4, which tested the moderating effects of SPO only accounted for an additional 3% of variance in cheating [r^2 = .34, $F\Delta(4, 63) = 0.70$, p = .60]. No main effect of SPO on cheating had been predicted nor was one observed [b = 4.22, β = .11, $t(74) = 0.94$, p = .35]. No significant two-way object-by-SPO [b = -3.02, β = -.08, $t(74)$ = -0.67, p = .50] or custody-by-SPO [b = 2.97, β = .08, $t(74) = 0.67$, p = .51] interactions had been predicted and none were observed. No significant three-way object-by-custody-by-SPO interaction was observed [b = -5.55, β = -.14, $t(74) = -1.18$, p = .24] (see the coefficients in Table 18 below).

[34] SE = s/√W = 29.48/√75 = 29.480/8.66 = 3.40

Table 18. Coefficients produced by the hierarchical simultaneous regression on number of raffle entries reportedly won (i.e., cheating).

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	58.642	57.010		1.029	.307
	Participant Age	-1.867	2.487	-.088	-.751	.455
	Session Size	3.896	1.922	.218	2.027	.046
	SP Satisfaction	.490	2.000	.028	.245	.807
	Average Mood	7.325	2.045	.382	3.582	.001
2	(Constant)	99.164	57.905		1.713	.091
	Participant Age	-3.580	2.513	-.169	-1.424	.159
	Session Size	4.996	1.939	.279	2.576	.012
	SP Satisfaction	-.968	2.060	-.056	-.470	.640
	Average Mood	7.440	1.986	.388	3.746	.000
	Custody	6.695	3.098	.228	2.161	.034
	Object	-4.957	3.346	-.165	-1.481	.143
3	(Constant)	92.391	57.595		1.604	.113
	Participant Age	-3.353	2.496	-.158	-1.343	.184
	Session Size	4.881	1.925	.273	2.536	.014
	SP Satisfaction	-.528	2.065	-.031	-.256	.799
	Average Mood	7.022	1.990	.366	3.529	.001
	Custody	7.596	3.131	.259	2.426	.018
	Object	-4.454	3.335	-.148	-1.335	.186
	Custody-by-Object	-4.616	3.131	-.158	-1.474	.145
4	(Constant)	96.834	59.496		1.628	.109
	Participant Age	-3.908	2.612	-.184	-1.496	.140
	Session Size	5.805	2.044	.325	2.841	.006
	SP Satisfaction	-.210	2.135	-.012	-.098	.922
	Average Mood	6.284	2.094	.327	3.001	.004
	Custody	7.888	3.217	.269	2.452	.017
	Object	-4.912	3.450	-.163	-1.424	.159
	Custody-by-Object	-4.617	3.201	-.158	-1.442	.154
	Average SPO	4.221	4.500	.110	.938	.352
	Custody-by-SPO	2.965	4.438	.077	.668	.507
	Object-by-SPO	-3.017	4.488	-.079	-.672	.504
	Three Way	-5.554	4.716	-.143	-1.178	.243

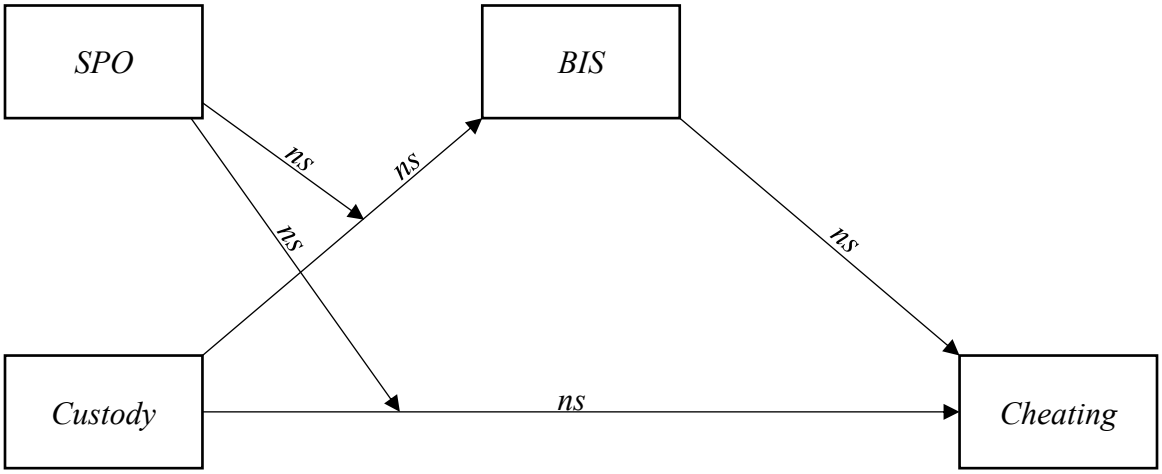
a. Dependent Variable: Raffle Entries

Legend: Raffle Entries = number of raffle entries reportedly won, Participant Age = participant's biological age, Session Size = number of participants in the session, SP Satisfaction = participant's level of satisfaction with his/her current device, Average Mood = average of all mood check items, Custody = Effects coded custody categorical predictor, Object = Effects coded object categorical predictor, Custody-by-Object = object by custody interaction, Average SPO = centered average SPO, Custody-by-SPO = custody-by-SPO interaction, Object-by-SPO = object-by-SPO interaction, Three Way = object-by-custody-by-SPO three-way interaction.

Moderated mediation. Recall that Hypothesis 9 predicts that psychological power will mediate the effect of smartphone custody on cheating. Hypothesis 10 predicted that SPO would moderate the effect of smartphone custody on psychological power such that those with higher levels of SPO would be more affected by the custody manipulation and those with lower levels of SPO would be less affected by the custody manipulation. In order to test both the mediation and moderation in a single analysis, the Hayes (2012) PROCESS procedure rather than simple mediational analysis (e.g., Preacher & Hayes, 2004) was used. The procedure, conceptual, and statistical models were the same described in Chapter 4. Also as before, because psychological power was measured two ways (BIS and BAS), two analyses were run and Hypothesis 9 was split into Hypothesis 9a (BIS) and Hypothesis 9b (BAS). Again, because these predictions apply only to smartphone custody (not student ID custody), analyses were run on only those in the smartphone condition (n = 46).

The first analysis assessed the effect of smartphone custody on cheating mediated by BIS and moderated by SPO. The model is depicted in Figure 21 below.

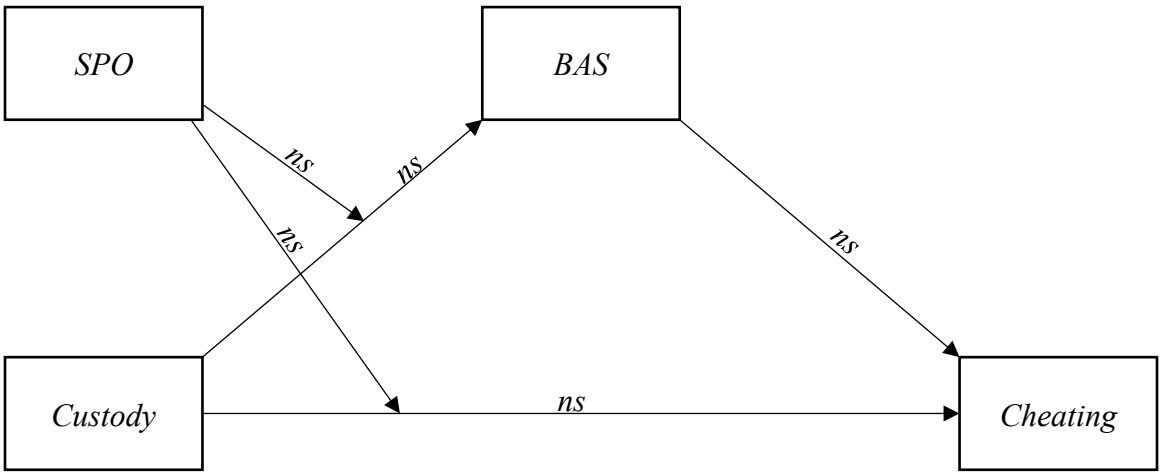
Figure 21. Test of Hypothesis 9a and Hypothesis 10.



This analysis revealed that smartphone custody did not significantly predict BIS [b = -.17, t(45) = -0.23, p = .82]. Also, the relationship between custody and BIS was not significantly moderated by SPO [b = .02, t(45) = 0.13, p = .90]. Smartphone custody did not significantly predict cheating [b = 5.35, t(45) = 0.12, p = .91]. SPO did not significantly moderate the effect of smartphone custody on cheating [b = -.98, t(45) = -0.09, p = .93]. BIS did not significantly predicted cheating [b = 3.09, t(45) = 0.33, p = .74]. Of primary interest, the indirect effect of the interaction between custody and SPO on cheating is -.02(3.09) = -.06. A 95% bootstrap confidence interval for this indirect effect (-2.17 to 4.49) contains zero thus the indirect effect of smartphone custody on moral orientation is not statistically different from zero and the mediation is not moderated. This is true at all levels of the moderator (SPO). Thus, neither Hypothesis 9a nor Hypothesis 10 were supported.

The second analysis assessed the effect of smartphone custody on cheating mediated by BAS and moderated by SPO. The model is depicted in Figure 22 below.

Figure 22. Test of Hypothesis 9b and Hypothesis 10.



This analysis revealed that smartphone custody did not significantly predict BAS [b = -.06, t(45) = -0.14, p = .89]. Also, the relationship between custody and BAS was not significantly moderated by SPO [b = -.01, t(45) = -0.10, p = .92]. Smartphone custody did not significantly predict cheating [b = 5.03, t(45) = 0.11, p = .82]. SPO did not significantly moderate the effect of smartphone custody on cheating [b = -.87, t(45) = -0.08, p = .94]. BAS did not significantly predicted cheating [b = 3.49, t(45) = 0.22, p = .82]. Of primary interest, the indirect effect of the interaction between custody and SPO on cheating is -.01(3.49) = -.04. A 95% bootstrap confidence interval for this indirect effect (-4.36 to 4.09) contains zero thus the indirect effect of smartphone custody on moral orientation is not statistically different from zero and the mediation is not moderated[35]. This was true at all levels of the moderator (SPO). Thus, neither Hypothesis 9b nor Hypothesis 10 was supported.

Discussion

Study 2 sought to test whether access to one's smartphone resulted in an increase in psychological power and in turn increased cheating behavior. Further, it sought to test whether the effect of smartphone custody on psychological power was moderated by a user's level of SPO. Results of the hierarchical simultaneous regression from Study 2 indicate that smartphone custody did not have the predicted effect on psychological ownership, nor did SPO moderate the effect of smartphone custody on psychological power.

[35] Because there was some uncertainty concerning seven participants that may have either been run in the smartphone or the student ID condition, both sets of moderated mediation analysis (for BIS and BAS) were run with and without those seven participants in the smartphone condition. The data provided is from the analysis with them run in the smartphone condition, as that seems to be the most likely scenario. However, the results are not altered by removing them either.

However, several unexpected effects were observed that warrant consideration. First, a significant main effect of object was observed on BIS such that those in the smartphone condition scores higher on BIS than did those in the student ID condition. The theories upon which hypotheses were based do not appear to offer a logical reason for this unexpected effect.

Second, there was an unexpected main effect of custody on cheating such that those in the access condition cheated more than those in the deprivation condition. Specifically, evidence of cheating was only observed in the student ID access condition. Again, it is difficult to imagine a theoretically defensible explanation for this finding. One conceivable explanation based on the Approach/Inhibition theory of psychology power would be that the presence of one's own student ID made salient one's own goals or activated the BAS. If true, this would be a very novel finding.

Finally, and perhaps most interestingly, the significant object-by-custody interaction observed on BAS was in the opposite direction from that which was predicted. Those in the smartphone deprivation condition scored higher on the BAS (measure of high power) than those in the smartphone access condition and this pattern was reversed for those in the student ID conditions. It would appear that, contrary to previous research (Egan & Larson, 2015), smartphone deprivation (rather than smartphone access) resulted in an increase in psychological power. Possible reasons for this unexpected direction will be discussed in Chapter 7.

CHAPTER VI

ADDITIONAL ANALYSES

Studies 1 and 2 are largely identical up and through the measure of psychological power. As illustrated in Figures 2 and 14, the procedures for both studies are identical until after the measure of psychological power, at which point they differ. As a result, many common variables exist between the two datasets. In order to allow for a couple of additional analyses, common variables from the datasets resulting from Study 1 and Study 2 were combined into one larger data set. Specifically, the measures of smartphone use, smartphone psychological ownership (SPO), psychological power (BIS and BAS) and the demographics (both basic and smartphone) were combined. Using this newly created, larger data set two specific additional tests were run. First, the possibility that insufficient statistical power existed as a result of an insufficient number of observations was explored. Second, as factor analysis benefits from larger data sets, a final factor analysis investigating the possible underlying factors of the scale of SPO was conducted in order to address the research question posed in Studies 1 and 2. The results of these analyses are discussed in this chapter.

Smartphone Custody and Psychological Power

One possible explanation for the lack of support for the main prediction that custody of one's smartphone would influence levels of psychological power is that there was insufficient power due to an insufficient sample size to observe significant effects. In order to explore this possibility, the predictions made regarding the effect of smartphone custody on power and the moderating role of SPO were retested using this new, larger dataset.

Combining the datasets yielded a sample of 231 participants (Study 1 = 156, Study 2 = 75; Males = 77, Females = 154). The number of observations per condition is provided in Table 19 (below).

Table 19. Number of observations per condition in the combined dataset.

Custody x Object Crosstabulation				
Count				
		Object		Total
		Student ID	Smartphone	
Custody	Access	52	64	116
	Deprivation	53	62	115
Total		105	126	231

Preliminary Analysis

After combining these datasets, internal consistency reliability of the various subscales was checked using Cronbach's alpha. Each produced an acceptable alpha level (see Table 20, below) with all of the original items. No items were removed. This was done in order to ensure that the measures used here were the same as those used in Studies 1 and 2 separately.

Table 20. Cronbach's alpha levels for subscales from combined dataset.

Scale	Alpha
Scale of Smartphone Psychological Ownership	.89
Smartphone Use	.76
BIS	.75
BAS	.74

The mood check items were treated the same as they were in Studies 1 and 2. Specifically, the three positively valenced items were averaged together to create an average positive mood score. The three negatively valenced items were averaged together to create an average negative mood score. Finally, an overall mood score was obtained by subtracting the average negative mood score from the average positive mood score. Therefore, on the overall mood index, higher number indicate a more positive mood.

Check for study effects. A multivariate analysis of variance (MANOVA) was done to see whether the study during which the data were collected had a significant effect on any of the outcome variables (BIS, BAS, or SPO), whether there were any significant mean differences on the basic or smartphone demographics, or any significant effects of Study on mood. This analysis indicated that there was no main effect of Study on any of the outcomes of interest: BIS [$F(1, 230) = 0.62$, $p = .43$, $\eta^2_p = .00$], BAS [$F(1, 230) = 0.00$, $p = .99$, $\eta^2_p = .00$], or SPO [$F(1, 230) = 0.23$, $p = .64$, $\eta^2_p = .00$]; nor did any of these effects approach significance. Nor did the samples significantly differ on any of the basic or smartphone demographics (see Table 21 below). There was however a significant effect of study on mood [$F(1, 230) = 4.89$, $p = .03$, $\eta^2_p = .02$] such that those in Study 2 ($M = 1.93$, $SE = 0.16$) reported being in a slightly more positive mood than those in Study 1 ($M = 1.49$; $SE = 0.11$). As will be discussed below, mood also significantly

correlates with BAS, and for these reasons will be treated as a covariate in the main analysis.

Table 21. Test of between-subjects effects produced by the MANOVA looking for effects of Study.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Average BIS	.178[a]	1	.178	.609	.436	.003
	Average BAS	5.533E-8[b]	1	5.533E-8	.000	.999	.000
	Average SPO	.135[c]	1	.135	.198	.657	.001
	Participant Age	.001[d]	1	.001	.000	.988	.000
	SP Age	.075[e]	1	.075	.012	.913	.000
	SP Months	23.951[f]	1	23.951	.266	.607	.001
	SP Functionality	1.496[g]	1	1.496	.681	.410	.003
	SP Satisfaction	.054[h]	1	.054	.021	.885	.000
	SP Tenure	.145[i]	1	.145	.036	.850	.000
	Average Mood	9.817[j]	1	9.817	4.893	.028	.021
Intercept	Average BIS	1874.495	1	1874.495	6392.866	.000	.966
	Average BAS	2034.869	1	2034.869	16981.174	.000	.987
	Average SPO	3337.966	1	3337.966	4908.091	.000	.956
	Participant Age	75653.879	1	75653.879	15239.537	.000	.985
	SP Age	44129.231	1	44129.231	6981.163	.000	.968
	SP Months	24928.673	1	24928.673	276.678	.000	.548
	SP Functionality	14105.148	1	14105.148	6421.232	.000	.966
	SP Satisfaction	14942.315	1	14942.315	5798.608	.000	.962
	SP Tenure	4216.423	1	4216.423	1040.108	.000	.820
	Average Mood	590.161	1	590.161	294.139	.000	.563
Study	Average BIS	.178	1	.178	.609	.436	.003
	Average BAS	5.533E-8	1	5.533E-8	.000	.999	.000
	Average SPO	.135	1	.135	.198	.657	.001
	Participant Age	.001	1	.001	.000	.988	.000
	SP Age	.075	1	.075	.012	.913	.000
	SP Months	23.951	1	23.951	.266	.607	.001
	SP Functionality	1.496	1	1.496	.681	.410	.003
	SP Satisfaction	.054	1	.054	.021	.885	.000
	SP Tenure	.145	1	.145	.036	.850	.000
	Average Mood	9.817	1	9.817	4.893	.028	.021
Error	Average BIS	66.853	228	.293			
	Average BAS	27.321	228	.120			
	Average SPO	155.062	228	.680			
	Participant Age	1131.864	228	4.964			
	SP Age	1441.231	228	6.321			
	SP Months	20542.767	228	90.100			
	SP Functionality	500.834	228	2.197			
	SP Satisfaction	587.529	228	2.577			
	SP Tenure	924.274	228	4.054			
	Average Mood	457.460	228	2.006			

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Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Total	Average BIS	2214.020	230				
	Average BAS	2342.267	230				
	Average SPO	3935.826	230				
	Participant Age	87191.000	230				
	SP Age	51598.750	230				
	SP Months	49541.250	230				
	SP Functionality	16664.000	230				
	SP Satisfaction	17564.000	230				
	SP Tenure	5740.750	230				
	Average Mood	1079.778	230				
Corrected Total	Average BIS	67.032	229				
	Average BAS	27.321	229				
	Average SPO	155.196	229				
	Participant Age	1131.865	229				
	SP Age	1441.305	229				
	SP Months	20566.718	229				
	SP Functionality	502.330	229				
	SP Satisfaction	587.583	229				
	SP Tenure	924.418	229				
	Average Mood	467.277	229				

a. R Squared = .003 (Adjusted R Squared = -.002), b. R Squared = .000 (Adjusted R Squared = -.004), c. R Squared = .001 (Adjusted R Squared = -.004), d. R Squared = .000 (Adjusted R Squared = -.004), e. R Squared = .000 (Adjusted R Squared = -.004), f. R Squared = .001 (Adjusted R Squared = -.003), g. R Squared = .003 (Adjusted R Squared = -.001), h. R Squared = .000 (Adjusted R Squared = -.004), i. R Squared = .000 (Adjusted R Squared = -.004), j. R Squared = .021 (Adjusted R Squared = .017).

Legend: Participant Age = participants chronological age, SP Age = age at which participant first got a smartphone, SP Months = number of months that participant has owned current device, SP Functionality = how well current device functions, SP Satisfaction = how satisfied participant is with current device, SP Tenure = number of years that participant has been a smartphone owner/user, Average Mood = average on overall mood index.

Chi-Square analyses were also performed to determine whether approximately the same proportion of males and females as well as smartphone users that use an iPhone versus another make/model took part in each study. Again, this analysis revealed no significant differences in either the gender of participants [$\chi^2(232) = 1.42$, $p = .24$] and/or the make/model of smartphone [$\chi^2(232) = 0.08$, $p = .85$]. Thus, it would seem that the data collected in the two studies and the type of participants that took part in each are comparable enough in important ways to justify combining the datasets for this purpose.

Detection of covariates. Next, correlational analysis was used to detect possible covariates. The following possible covariates were checked: mood, session size, participant age, age at which participant first got a smartphone, length the participant has owned his or her current smartphone, smartphone functionality, smartphone satisfaction, and total length that participant has been a smartphone owner/use (smartphone tenure) [see Table 22, below]. None were found to significantly correlate with BIS, and only mood was found to positively correlate with BAS (r = .21, p = .00) such that those who reported being in a more positive mood also scored higher on the measure of BAS. Thus mood will be included as a covariate in the main regression analysis below.

Table 22. Correlational analysis done to detect possible covariates in combined dataset.

Correlations

		Average BIS	Average BAS	Average Mood	Session Size	Participant Age	SP Age	SP Months	SP Function	SP Satisfaction	SP Tenure
Average BIS	Pearson Correlation	1	-.042	-.013	-.021	-.043	-.107	-.002	.065	.040	.088
	Sig. (2-tailed)		.521	.847	.749	.514	.106	.970	.324	.545	.183
	N	231	231	231	231	231	231	230	231	231	231
Average BAS	Pearson Correlation	-.042	1	.213**	-.021	-.107	-.084	.045	.068	.071	-.009
	Sig. (2-tailed)	.521		.001	.753	.105	.203	.501	.305	.282	.893
	N	231	231	231	231	231	231	230	231	231	231
Average Mood	Pearson Correlation	-.013	.213**	1	-.102	.070	.105	.068	.048	.073	-.048
	Sig. (2-tailed)	.847	.001		.122	.288	.111	.308	.471	.269	.467
	N	231	231	231	231	231	231	230	231	231	231
Session Size	Pearson Correlation	-.021	-.021	-.102	1	.003	-.040	.106	-.013	-.056	.053
	Sig. (2-tailed)	.749	.753	.122		.961	.547	.108	.846	.393	.419
	N	231	231	231	231	231	231	230	231	231	231
Participant Age	Pearson Correlation	-.043	-.107	.070	.003	1	.644**	.050	-.070	-.080	.295**
	Sig. (2-tailed)	.514	.105	.288	.961		.000	.450	.292	.224	.000
	N	231	231	231	231	231	231	230	231	231	231
SP Age	Pearson Correlation	-.107	-.084	.105	-.040	.644**	1	.059	.012	-.044	-.538**
	Sig. (2-tailed)	.106	.203	.111	.547	.000		.371	.858	.507	.000
	N	231	231	231	231	231	231	230	231	231	231

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		Average BIS	Average BAS	Average Mood	Session Size	Participant Age	SP Age	SP Months	SP Function	SP Satisfaction	SP Tenure
SP Months	Pearson Correlation	-.002	.045	.068	.106	.050	.059	1	-.371**	-.325**	-.016
	Sig. (2-tailed)	.970	.501	.308	.108	.450	.371		.000	.000	.811
	N	230	230	230	230	230	230	230	230	230	230
SP Function	Pearson Correlation	.065	.068	.048	-.013	-.070	.012	-.371**	1	.666**	-.090
	Sig. (2-tailed)	.324	.305	.471	.846	.292	.858	.000		.000	.172
	N	231	231	231	231	231	231	230	231	231	231
SP Satis-faction	Pearson Correlation	.040	.071	.073	-.056	-.080	-.044	-.325**	.666**	1	-.031
	Sig. (2-tailed)	.545	.282	.269	.393	.224	.507	.000	.000		.638
	N	231	231	231	231	231	231	230	231	231	231
SP Tenure	Pearson Correlation	.088	-.009	-.048	.053	.295**	-.538**	-.016	-.090	-.031	1
	Sig. (2-tailed)	.183	.893	.467	.419	.000	.000	.811	.172	.638	
	N	231	231	231	231	231	231	230	231	231	231

**. Correlation is significant at the 0.01 level (2-tailed).

Legend: Average BIS = average BIS, Average BAS = average BAS, Average Mood = average on overall mood index, Session Size = session size, Participant Age = participants chronological age, SP Age = age at which participant first got a smartphone, SP Months = number of months a participant has owned current device, SP Function = how well current device functions, SP Satisfaction = how satisfied participant is with current device, SP Tenure = number of years a participant has been a smartphone owner/user.

Main Analysis

The same two hierarchical simultaneous regressions (on BIS and BAS) were performed on the combined dataset as were done on the individual datasets in Studies 1 and 2. Specifically, the covariate (mood) was controlled for in Block 1. Block 2 tested the main effects of custody and objects (using the same effects coding as described in Studies 1 and 2). Block 3 tested the interaction between object and custody. Block 4 tested the moderating effects of SPO. Again SPO was centered and multiplied with the effects coded categorical predictors (custody and objects) to create interactions terms for each categorical predictor as well as a three-way object-by-custody-by-SPO interaction term that tested the prediction that SPO moderates the effect of smartphone custody on psychological power.

The predictions are identical to those tested in Studies 1 and 2 independently. Smartphone access is expected to result in an increase in BAS and a decrease in BIS compared both with smartphone deprivation as well as either of the student ID conditions. By contrast, smartphone deprivation is expected to result in an increase in BIS and a decrease in BAS compared with smartphone access as well as either of the Student ID conditions. Again, SPO is expected to moderate the effect of smartphone custody on psychological power such that those with higher levels of SPO will be more affected by the custody manipulation than those with lower levels of SPO.

BIS. Block 1 of the hierarchical simultaneous regression did not account for a significant amount of variance in BIS scores [r^2 = .00, $F\Delta(1, 229) = 0.04$, p = .85] as mood did not predict BIS scores [b = -.01, β = -.01, $t(229) = -0.19$, p = .85].

Block 2, which tested the main effects of custody and object, accounted for only 0.5% more variance in BIS scores [r^2 = .01, $F\Delta(2, 227) = 0.54$, p = .59]. No main effect was expected or observed for either custody [b = -.02, β = -.04, $t(229) = -0.64$, p = .52] or object [b = -.03, β = .06, $t(229) = 0.82$, p = .41].

Block 3, which tested the interaction between custody and object, accounted for no more variance [r^2 = .01, $F\Delta(1, 226) = 0.00$, p = .96]. A significant two-way object-by-custody interaction was expected but not observed [b = -.00, β = -.00, $t(229) = -0.05$, p = .96].

Block 4, which tested the moderating effects of SPO, accounted for 6% more variance [r^2 = .07, $F\Delta(4, 222) = 3.57$, p = .01] which was a statistically significant amount. No main effect of SPO was expected but one was observed [b = 0.17, β = 0.25, $t(229) = 3.72$, p = .00] such that for every one point increase in SPO a 0.17 point increase would be expected in BIS scores. No interactions were expected between either SPO and custody [b = -.01, β = -.02, $t(229) = -0.30$, p = .74] or object [b = -.02, β = -.03, $t(229) = -0.40$, p = .69] and none were observed. A three-way object-by-custody-by-SPO interaction was expected but not observed [b = -.03, β = -.05, $t(229) = -0.71$, p = .48] [see Table 23, below].

Table 23. Coefficients produced by the hierarchical simultaneous regression on BIS using the combined dataset.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.064	.054		56.660	.000
	Average Mood	-.005	.025	-.013	-.193	.847
2	(Constant)	3.063	.054		56.538	.000
	Average Mood	-.006	.025	-.016	-.248	.805
	Custody	-.023	.036	-.042	-.639	.523
	Object	.030	.036	.055	.822	.412
3	(Constant)	3.063	.054		56.356	.000
	Average Mood	-.006	.025	-.017	-.249	.803
	Custody	-.023	.036	-.042	-.631	.529
	Object	.030	.036	.055	.820	.413
	Object-by-Custody	-.002	.036	-.003	-.047	.963
4	(Constant)	3.097	.054		57.144	.000
	Average Mood	-.029	.025	-.076	-1.134	.258
	Custody	-.006	.035	-.011	-.168	.866
	Object	.030	.035	.056	.852	.395
	Object-by-Custody	-.001	.035	-.001	-.021	.983
	Average SPO	.165	.044	.251	3.721	.000
	Object-by-SPO	-.017	.043	-.026	-.397	.692
	Custody-by-SPO	-.013	.043	-.020	-.301	.764
	Three Way	-.031	.043	-.047	-.705	.482

a. Dependent Variable: Average BIS

Legend: Average Mood = average on mood items, Custody = effects coded custody, Object = effects coded object, Object-by-Custody = object-by-custody interaction term, Average SPO = centered average SPO, Object-by-SPO = object-by-SPO interaction term, Custody-by-SPO = custody-by-SPO interaction term, Three Way = object-by-custody-by-SPO interaction term.

BAS. Block 1 of the hierarchical simultaneous regression accounted for 4.6% of variance in BAS scores [r^2 = .05, $F\Delta(1, 229) = 10.92$, p = .001] as mood significantly predicted BAS scores [b = .05, β = .21, $t(229) = 3.31$, p = .001]. Specifically, an increase of one point in mood would be expected to correspond with a .05 increase in BAS scores.

Block 2, which tested the main effects of custody and object, accounted for only 0.2% more variance in BAS scores [r^2 = .05, $F\Delta(2, 227) = 0.23$, p = .79]. No main

effects were expected or observed for either custody [b = -.02, β = -.04, t(229) = -0.65, p = .52] or object [b = .01, β = .01, t(229) = 0.20, p = .84].

Block 3, which tested the interaction between custody and object, accounted for only 0.2% more variance in BAS scores [r^2 = .05, $F\Delta$(1, 226) = 0.38, p = .54]. A significant two-way object-by-custody interaction was expected but not observed [b = -.01, β = -.04, t(229) = -0.62, p = .54].

Block 4, which tested the moderating effects of SPO, accounted for 5.6% more variance in BAS scores [r^2 = .11, $F\Delta$(4, 222) = 3.48, p = .01] which was statistically significant. No main effect of SPO was expected but one was observed [b = 0.10, β = 0.23, t(229) = 3.53, p = .001] such that for every one point increase in SPO a 0.10 point increase would be expected in BAS scores. No interactions were expected between either SPO and custody [b = -.00, β = -.01, t(229) = -0.14, p = .89] or object [b =.03, β =.06, t(229) = 0.99, p = .33] and none were observed. A three-way object-by-custody-by-SPO interaction was expected but not observed [b = .01, β = .02, t(229) = 0.35, p = .73] (see Table 24, below).

Table 24. Coefficients produced by the hierarchical simultaneous regression on BAS combined dataset.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.089	.034		91.570	.000
	Average Mood	.052	.016	.213	3.305	.001
2	(Constant)	3.089	.034		91.257	.000
	Average Mood	.051	.016	.213	3.275	.001
	Custody	-.015	.022	-.042	-.651	.515
	Object	.005	.022	.013	.201	.841
3	(Constant)	3.090	.034		91.063	.000
	Average Mood	.051	.016	.211	3.235	.001
	Custody	-.013	.022	-.039	-.591	.555
	Object	.005	.022	.013	.205	.838
	Object-by-Custody	-.014	.022	-.040	-.617	.538
4	(Constant)	3.111	.034		91.873	.000
	Average Mood	.038	.016	.157	2.376	.018
	Custody	-.002	.022	-.006	-.095	.924
	Object	.008	.022	.023	.354	.723
	Object-by-Custody	-.009	.022	-.028	-.428	.669
	Average SPO	.098	.028	.233	3.529	.001
	Object-by-SPO	.027	.027	.063	.985	.325
	Custody-by-SPO	-.004	.027	-.009	-.138	.891
	Three Way	.009	.027	.022	.348	.728

a. Dependent Variable: Average BAS

Legend: Average Mood = average on mood items, Custody = effects coded custody, Object = effects coded object, Object-by-Custody = object-by-custody interaction term, Average SPO = centered average SPO, Object-by-SPO = object-by-SPO interaction term, Custody-by-SPO = custody-by-SPO interaction term, Three Way = object-by-custody-by-SPO interaction term.

Statistical Power

One final test was done in order to assess the size of the effects and the observed power to detect significant results. SPO, which has thus far been treated as a continuous predictor, was transformed into a categorical predictor at three levels (low, medium, and high). This allowed the predicted two- and three-way interactions to be tested using a MANOVA (with BIS and BAS as the dependent variables). Consistent with the results of the regression, results of the MANOVA revealed that neither the predicted two-way

object-by-custody nor the predicted three-way object-by-custody-by-SPO interactions were significant for either BIS or BAS. Also consistent with the regression, there was a significant main effect of SPO on both BIS [$F(2, 230) = 8.07$, $p = .00$, $\eta^2_p = .07$, power = .96] and BAS [$F(2, 230) = 8.99$, $p = .00$, $\eta^2_p = .08$, power = .97]. In both cases, pairwise comparison reveals the differences to be between the high group compared with the medium and low groups. Those with high ($M = 3.22$, $SE = .06$) SPO scored higher on BIS than both those with medium ($M = 3.00$, $SE = .06$, $p = .01$) and low ($M = 2.89$, $SE = .06$, $p = .00$) levels of SPO, whereas the difference between those with medium and low levels was not significantly different ($p = .21$). Likewise, those with high ($M = 3.29$, $SE = .04$) SPO scored higher on BAS than both those with medium ($M = 3.15$, $SE = .04$, $p = .01$) and low ($M = 3.06$, $SE = .04$, $p = .00$) levels of SPO, whereas the difference between those with medium and low levels was not significantly different ($p = .11$).

Importantly, this analysis also revealed that the effects sizes for each of the predicted (two- and three-way) interactions are so small (see Table 25, below) that neither approached Cohen's (1992) standard of .8 for observed power. The following equation was used to estimate the needed sample size based on the observed effects sizes: $n = 2(Z_a + Z_{1-\beta})^{2\sigma 2,} / \Delta^2$ (Kadam & Bhalerao, 2010). Assuming an alpha of .05, 80% power (per Cohen, 1992), and given the observed effects size for the predicted two- and three-way interactions (about .001), a sample of 7,598 participants would be needed[36]. This may be due either to the fact that the actual effect is very small, or it may be due to the fact that methodological flaws introduced too much unexplained variance (i.e., noise)

[36] $n = 2(1.96+.8416)^2(.022)^2 / (.001)^2 = 2(2.8016)^2(.000484) / .000001 = 2(7.84896256)(.000484) / .000001 = 15.69792512(.000484) / .000001 = .00759779575808 / .000001 = 7597.79575808$

into the data making the effect seem very small. This will be discussed in greater detail in the next chapter.

Table 25. Test of between-subjects effects produced by the MANOVA performed on the combined dataset.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
Corrected Model	Average BIS	6.406[a]	11	.582	2.103	.021	.096	23.136	.915
	Average BAS	2.520[b]	11	.229	2.021	.028	.092	22.231	.901
Intercept	Average BIS	2056.449	1	2056.449	7427.563	.000	.971	7427.563	1.000
	Average BAS	2240.057	1	2240.057	19765.111	.000	.989	19765.111	1.000
Custody	Average BIS	.034	1	.034	.122	.727	.001	.122	.064
	Average BAS	.004	1	.004	.034	.854	.000	.034	.054
Object	Average BIS	.293	1	.293	1.058	.305	.005	1.058	.176
	Average BAS	.025	1	.025	.216	.642	.001	.216	.075
SPO Hi/Med/Low	Average BIS	4.471	2	2.235	8.074	.000	.069	16.147	.956
	Average BAS	2.038	2	1.019	8.991	.000	.076	17.983	.973
Custody * Object	Average BIS	.010	1	.010	.035	.852	.000	.035	.054
	Average BAS	.030	1	.030	.263	.609	.001	.263	.080
Custody * SPO Hi/Med/Low	Average BIS	1.179	2	.590	2.130	.121	.019	4.260	.434
	Average BAS	.015	2	.007	.065	.937	.001	.130	.060
Object * SPO Hi/Med/Low	Average BIS	.858	2	.429	1.549	.215	.014	3.099	.327
	Average BAS	.136	2	.068	.599	.550	.005	1.198	.149
Custody * Object * SPO Hi/Med/Low	Average BIS	.026	2	.013	.047	.954	.000	.093	.057
	Average BAS	.016	2	.008	.069	.934	.001	.138	.060
Error	Average BIS	60.634	219	.277					
	Average BAS	24.820	219	.113					
Total	Average BIS	2223.898	231						
	Average BAS	2353.207	231						
Corrected Total	Average BIS	67.039	230						
	Average BAS	27.340	230						

a. R Squared = .096 (Adjusted R Squared = .050), b. R Squared = .092 (Adjusted R Squared = .047), c. Computed using alpha = .05.

Legend: Average BIS = average BIS, Average BAS = average BAS, SPO Hi/Med/Low = categorical SPO variable

Smartphone Psychological Ownership Factor Analysis

Rather than addressing the research question, "Does the relationship between SPO and psychological power differ depending on the route by which those feelings developed or the motives served by those feelings?", individually using the datasets from Studies 1 and 2, because factor analysis benefits from larger datasets, and because the same questions is posed for each study, the question as to whether SPO is comprised of subscales is best addressed by using the combined dataset.

Remember that the scale was based on the theory of psychological ownership and the three routes and motives proposed by Pierce et al. (2003). Table 26 (below) lists the 18 items, shows the route or motive to which the item was written to correspond, and lists the variable name as it appears on the tables below.

Table 26. Scale development for measure of smartphone psychological ownership.

Theory of Psychological Ownership (Pierce, Kostova, and Dirks, 2003)		**SPO Items** (Egan & Larson, 2015)	**Variable Name**
Routes by which feelings of psychological ownership develop toward an object	Controlling the target object	I am very possessive of my smartphone.	SPO7
		Other people often use my smartphone. (reverse scored)	SPO5_Re
		I would be willing to let a friend borrow my smartphone for the day (reverse scored).	SPO9_Re
	Intimate knowledge of the target object	I feel like I've gotten to "know" my smartphone like one does a friend.	SPO4
		I know how to use all of the features of my smartphone.	SPO11
		I am very familiar with my smartphone.	SPO14
	Investing the self in the target object	I have taken a lot of time to personalize my smartphone.	SPO12
		I always have my smartphone with me.	SPO8
		I spend a lot of time using my smartphone.	SPO6
Motives driving the development of feelings of psychological ownership toward an object	Efficacy & Effectance	My smartphone makes me feel more capable.	SPO13
		I am able to accomplish a lot more as a result of having my smartphone.	SPO18
		My smartphone is extremely useful in helping me achieve my goals.	SPO10
	Self-Identity	My smartphone is an extension of myself.	SPO15
		My smartphone reflects my personality.	SPO2
		I have a lot of personal information stored on my smartphone.	SPO1
	Having a Place	My smartphone is a kind of "home-away-from-home."	SPO17
		My smartphone makes me feel connected to home wherever I am.	SPO3
		I would feel lost without my smartphone.	SPO16

As there is some overlap and redundancy between the routes and motives, there is also some overlap between items where it appears that an item could correspond with more than one route or motive. Specifically, the "Investing the self in the target object" (a route) and the "Self-Identity" (a motive) items seem to overlap because to the extent that one invests themselves into an object, that object is likely to become more involved in his or her self-identity.

The theory of psychological ownership would seem to suggest either a two- or six-factor solution. A two-factor solution may be expected if the items corresponding to

the routes all load onto one factor and the items corresponding to the motives all load onto a second factor. However, as mentioned above, there seems to be conceptual overlap between certain routes and motives making this solution unlikely to provide a good fit. Alternately, a six-factor solution may be expected if each of the three routes and each of the three motives are distinct subcomponents.

First, principal components analysis (PCA) was conducted to see the number of subscales that naturally emerged from the items. Then, confirmatory factor analysis (CFA) was done to test the fit of the proposed two- and six-factor solutions. Each analysis is discussed separately below.

Principal Components Analysis

PCA yielded five Eigenvalues greater than one suggesting a five-factor solution. Table 27 (below) shows which items load onto each of the five factors while Table 28 (below) shows specifically which items and their corresponding routes or motives appear to load onto each of the factors and seeks to identify themes among the emerging factors.

Table 27. Rotated component matrix for the five-factor solution produced by the principal components analysis.

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
SPO3	.744				
SPO17	.730	.288			
SPO4	.669		.315		
SPO2	.661		.274		
SPO15	.652		.258		
SPO6		.787			
SPO8		.716			
SPO7	.273	.620		.319	
SPO16	.469	.593			
SPO1	.308	.437	.416		
SPO11			.826		
SPO14			.770		
SPO12	.483		.601		
SPO18				.801	
SPO10			.287	.757	
SPO13	.432	.258		.560	
SPO5_Re					.840
SPO9_Re	.330	.290			.601

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Looking at Table 28 (below), it does appear that certain themes do emerge for some of the factors. For instance, efficacy and effectance motives clearly map onto the fourth factor. However, factors one and two in particular, do not seem to exhibit a clear theme. The five-factor PCA solution does not map onto the theoretically predicted categories well, and does not appear to have produced clean factors given that multiple items load onto multiple factors.

Table 28. Routes and motives represented in each of the factors of the five-factor solution.

Factor	Items	Scale Route/Motive	Theme
1	3	Motive: Having a Place	Not Clear / Motive: Having a Place (40%) & Motive: Self-Identity (40%)
	17	Motive: Having a Place	
	4	Route: Intimate Knowledge of Target	
	2	Motive: Self-Identity	
	15	Motive: Self-Identity	
2	6	Route: Investing the Self in the Target	Route: Investing the Self in the Target (40%)
	8	Route: Investing the Self in the Target	
	7	Route: Control over Target	
	16	Motive: Having a Place	
	1	Motive: Self-Identity	
3	11	Route: Intimate Knowledge of the Target	Route: Intimate Knowledge of the Target (67%)
	14	Route: Intimate Knowledge of the Target	
	12	Route: Investing the Self in the Target	
4	18	Motive: Efficacy & Effectance	Motive: Efficacy & Effectance (100%)
	10	Motive: Efficacy & Effectance	
	13	Motive: Efficacy & Effectance	
5	5	Route: Control over Target	Route: Control over Target (100%)
	9	Route: Control over Target	

Confirmatory Factor Analysis

First, the proposed two-factor solution was tested using CFA. Eleven items map onto the first factor, and 7 map onto the second factor. Again, the factor loadings are depicted in a pair of tables below. The first table (Table 29) shows which items load onto each of the two factors. The second table (Table 30) shows specifically which items and their corresponding routes or motives load onto each of the two factors and seeks to identify themes among the factors.

Table 29. Rotated component matrix for the two-factor solution produced by the principal components analysis.

Rotated Component Matrix[a]

	Component	
	1	2
SPO10	.702	
SPO12	.675	.321
SPO14	.671	
SPO2	.642	
SPO13	.636	.320
SPO11	.585	
SPO3	.581	
SPO15	.575	.512
SPO4	.564	.403
SPO18	.516	
SPO1	.442	.285
SPO16		.720
SPO9_Re		.692
SPO7	.334	.649
SPO8		.533
SPO17	.476	.531
SPO6	.373	.492
SPO5_Re	-.311	.425

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Table 30. Routes and motives represented in each of the factors of the two-factor solution.

Factor	Items	Scale Route/Motive	Theme
1	2	Motive: Self-Identity	Motives (64% of the items):
	10	Motive: Efficacy & Effectance	
	14	Route: Intimate Knowledge of the Target	
	12	Route: Intimate Knowledge of the Target	
	13	Motive: Efficacy & Effectance	
	11	Route: Intimate Knowledge of the Target	
	3	Motive: Having a Place	
	15	Motive: Self-Identity	
	4	Route: Intimate Knowledge of the Target	
	18	Motive: Efficacy & Effectance	
	1	Motive: Self-Identity	
2	16	Motive: Having a Place	Routes (71% of the items)
	9	Route: Control over the Target	
	7	Route: Control over the Target	
	8	Route: Investing the Self into the Target	
	17	Motive: Having a Place	
	6	Route: Investing the Self into the Target	
	5	Route: Control over the Target	

The two-factor solution was tested to see whether the routes and motives mapped onto two underlying constructs; however, this does not appear to be the case. While 64% of the items on factor one are motives and 71% of the items on factor two are motives, there is a considerable amount of the overlap. On the scale, there were nine items each for routes and motives. Seven of the nine items written for motives (78%) do map onto factor one leaving only two that map onto factor two. However, only five of the nine items written for routes (56%) map onto factor two leaving four that map onto factor one. Thus, the two factors do not neatly break into routes and motives.

Next, the proposed six-factor solution was tested. Again the solution has been represented in a pair of tables below. Table 31 shows which items load onto each of the six factors. The second table, Table 32, shows again which items and their corresponding

routes or motives load onto each of the six factors and seeks to identify themes among the six factors.

Table 31. Rotated component matrix for the six-factor solution produced by the confirmatory factor analysis.

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
SPO17	.815	.289				
SPO3	.702				.263	
SPO4	.642		.318			
SPO15	.628		.259	.251		
SPO8		.729	.269			
SPO6		.726			.424	
SPO7	.270	.608		.318		
SPO16	.550	.595				
SPO11			.871			
SPO14			.786			
SPO12	.384		.538		.375	
SPO10				.787		
SPO18				.773		
SPO13	.318			.614	.342	
SPO1		.318			.721	
SPO2	.446			.270	.659	
SPO5_Re						.879
SPO9_Re	.320	.267				.617

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

Two of the three "having a place" motive items map onto the first factor, two of the three "investing the self" route items map onto the second factor, two of the three "intimate knowledge" route items map onto the third factor, all of the efficacy and effectance motive items map onto the fourth factor, two of the three self-identity motive items map onto the fifth factor, and two of the three control route items map onto the sixth factor. So the six-factor solution does appear to offer a better fit than the five-factor solution and is relatively consistent with the theoretical foundation on which the items were written.

Table 32. Routes and motives represented in each of the factors of the six-factor solution.

Factor	Items	Scale Route/Motive	Theme
1	17	Motive: Having a Place	Motive: Having a Place (50%)
	3	Motive: Having a Place	
	4	Route: Intimate Knowledge of the Target	
	15	Motive: Self-Identity	
2	8	Route: Investing the Self in the Target	Route: Investing the Self in the Target (50%)
	6	Route: Investing the Self in the Target	
	7	Route: Control of the Target	
	16	Motive: Having a Place	
3	11	Route: Intimate Knowledge of the Target	Route: Intimate Knowledge of the Target (67%)
	14	Route: Intimate Knowledge of the Target	
	12	Route: Investing the Self in the Target	
4	10	Motive: Efficacy & Effectance	Motive: Efficacy & Effectance (100%)
	18	Motive: Efficacy & Effectance	
	13	Motive: Efficacy & Effectance	
5	1	Motive: Self-Identity	Motive: Self-Identity (100%)
	2	Motive: Self-Identity	
6	5	Route: Control over the Target	Route: Control over the Target (100%)
	9	Route: Control over the Target	

It appears, that of the two-, five-, and six-factor solutions tested, the six-factor solution provides the best fit in that it results in subscales that most neatly correspond with those predicted by the theory of psychological ownership (Pierce, et al., 2003).

Thus far, I have used a top-down, or a theory drive approach to assign construct labels to the factors. It is also beneficial, having identified what appear to be the correct factors, to look at the individual items that load onto the various factors and to determine whether they are best represented by the a priori routes and motives suggested by the theory or whether together they suggest somewhat different constructs. Table 33 (below) shows the exact wording of the items that map onto each factor and an assigned post hoc theme informed by the individual items. In other words, I now apply a bottom-up approach to identifying a theme for each of the six factors.

Table 33. Post hoc analysis of themes emerging from the six-factor solution.

Factor	Items	Theme
1	My smartphone is a kind of "home-away-from-home".	Intimacy / Personal Connection
	My smartphone makes me feel connected to home wherever I am.	
	I feel that I've gotten to "know" my smartphone like one does a friend.	
	My smartphone is an extension of myself.	
2	I always have my smartphone with me.	Use / Dependence
	I spend a lot of time using my smartphone.	
	I am very possessive of my smartphone.	
	I would feel lost without my smartphone.	
3	I know how to use all of the features of my smartphone.	Familiarity / Expertise
	I am very familiar with my smartphone.	
	I have taken a lot of time to personalize my smartphone.	
4	My smartphone is extremely useful in helping me achieve my goals.	Efficacy / Effectance
	I am able to accomplish a lot more as a result of having my smartphone.	
	My smartphone makes me feel more capable.	
5	I have a lot of personal information stored on my smartphone.	Self-Identity
	My smartphone reflects my personality.	
6	Other people often use my smartphone*	Control
	I would be willing to let a friend borrow my smartphone for the day*	

*Reverse scored items.

Factor 1 seems to contain the items that indicate the most intimate relationship with the smartphone – that the device represents themselves, a friend, or their home. This is similar to the theoretically derived theme – the motive of having a place – but also somewhat different. Together, these four items seem to suggest a strong theme of intimacy or personal connection.

Factor 2 appears to reflect how much a person uses and relies on their device. The theoretically derived theme was the route of investing the self into the target object. Together however, these items seem to better indicate a dependence on the device evidenced by very frequent use. This factor would be expected to correlate most strongly with self-reported level of smartphone usage; a possibility that will be explored shortly.

Factor 3 seems to suggest that these users are experts at using their device and can best be described as "familiarity or expertise." This is conceptually similar to the a priori theoretical theme "intimate knowledge of the target object". Users high on this dimension likely know how to maximize the features of their device because they have taken the time to get to know how to use it and to customize it to their preferences.

Factor 4 clearly contains items pertaining to efficacy and effectance; which is perfectly aligned with the theoretically derived theme as all three of the items written to correspond to the efficacy/effectance motive mapped onto this factor. It would seem reasonable to expect that Factor 3 and Factor 4 would strongly correlate with one another. In other words, those that indicate the most familiarity and expertise with their device likely derive the most useful from it. Again, this possible relationship will be explored shortly.

Factor 5 is made up of two items originally written based on the self-identity motive and appear to best reflect the smartphone as a means of expressing or building one's sense of self.

Factor 6 is made up of two items originally written based on the control route. It is worth noting that these two are also the only items written to be reverse scored. It is not uncommon for reversed items to fit poorly with other items, and this may account for these two items loading onto a factor together. It is possible that had these items been written in the same direction as the rest of the scale, they would have mapped onto a different factor, making the five-factor solution a better fit. If so, they would read: "Other people rarely use my smartphone." and "I would be unwilling to let a friend borrow my smartphone for the day." If written as such, it seems plausible that they may

map onto Factor 2, the "Use / Dependence" scale. If so, a very strong positive correlation would be expected between factors two and six.

Subscale Supplementary Analysis

To further explore the six subscales suggested by the CFA, reliability analysis was performed for each of the subscales, subscales scores were created by averaging together their corresponding items, and correlations were tested to see whether subscales correlated with other theoretically predicted constructs.

Reliability testing. With all 18 items, using the combined dataset, Cronbach's alpha for the SPO was .89. It could be improved to .90 by removing reverse-scored item number five, but could not be improved beyond that. However, this step was not taken because the scale already exhibited sufficient internal consistency reliability and including all 18 items made the scale average based on the same items as in Studies 1 and 2.

Cronbach's alpha for each of the subscales are provided in Table 34 below. "CFA Alphas" are those with the items indicated by the CFA included in the subscale. "Original Alphas" are those obtained if the three items that were originally written to correspond to the route or motive are tested as a subscale. This was done to assess the increase in internal consistency reliability by basing subscales on the items indicated by the CFA rather than those items originally written to go together. As is evident by the table, only the self-identity motive subscale reaches a higher internal consistency reliability by using the original three items rather than the items identified using CFA. Otherwise, the subscales created based on the CFA loadings yield higher internal consistency reliability.

Table 34. Reliability analysis for the six factors suggested by the CFA.

Factor	Theme	CFA Alphas[a]	Original Alphas[b]
1	Intimacy / Personal Connection (Motive: Having a Place)	.81	.74
2	Use / Dependence (Route: Investing the Self in the Target)	.75	.58(.61)
3	Familiarity / Expertise (Route: Intimate Knowledge of the Target)	.78	.70(.75)
4	Efficacy / Effectance (Motive: Efficacy & Effectance)	.72	.72
5	Self-Identity (Motive: Self-Identity)	.56	.67
6	Control (Route: Control over the Target)	.44	.51(.52)

a. None of the alphas could be improved by removing poorly fitting items.
b. Vales in parentheses represent the highest alpha that could be achieved by removing poorly fitting items.

Correlations. Table 35 (below) shows the correlations among the factor averages, the smartphone demographics, and psychological power. All of the factors significantly positively correlate with one another with the exception that Factor 4 (Efficacy/Effectance) does not correlate with Factor 6 (Control).

Table 35. Correlations among smartphone psychological ownership factors, smartphone use, smartphone demographics, and psychological power.

Correlations

		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	SP Use	Pos. Mood	Neg. Mood	BIS	BAS	SP Age	SP Month	SP Funct	SP Satis	SP Ten.
Factor 1	Pearson Corr.	1	.593**	.542**	.529**	.554**	.234**	.367**	.274**	.072	.167*	.239**	-.172**	.019	.115	.165*	.109
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.278	.011	.000	.009	.775	.080	.012	.099
	N	231	231	231	231	231	231	231	231	231	231	231	231	230	231	231	231
Factor 2	Pearson Corr.	.593**	1	.426**	.465**	.463**	.296**	.526**	.218**	.070	.281**	.187**	-.246**	-.007	.053	.074	.088
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.001	.289	.000	.004	.000	.911	.420	.265	.180
	N	231	231	231	231	231	231	231	231	231	231	231	231	230	231	231	231
Factor 3	Pearson Corr.	.542**	.426**	1	.473**	.499**	.218**	.473**	.187**	.001	.112	.246**	-.286**	.040	.102	.150*	.109
	Sig. (2-tailed)	.000	.000		.000	.000	.001	.000	.004	.985	.089	.000	.000	.541	.123	.022	.099
	N	231	231	231	231	231	231	231	231	231	231	231	231	230	231	231	231
Factor 4	Pearson Corr.	.529**	.465**	.473**	1	.414**	.105	.399**	.222**	.103	.125	.271**	-.069	.056	.173**	.171**	.062
	Sig. (2-tailed)	.000	.000	.000		.000	.112	.000	.001	.117	.058	.000	.293	.394	.008	.009	.349
	N	231	231	231	231	231	231	231	231	231	231	231	231	230	231	231	231
Factor 5	Pearson Corr.	.554**	.463**	.499**	.414**	1	.133*	.408**	.124	-.043	.148*	.236**	-.207**	.053	.083	.145*	.055
	Sig. (2-tailed)	.000	.000	.000	.000		.043	.000	.059	.515	.024	.000	.002	.426	.207	.028	.402
	N	231	231	231	231	231	231	231	231	231	231	231	231	230	231	231	231
Factor 6	Pearson Corr.	.234**	.296**	.218**	.105	.133*	1	.085	.006	-.019	.149*	-.071	-.060	-.045	.021	-.018	.099
	Sig. (2-tailed)	.000	.000	.001	.112	.043		.196	.924	.773	.024	.282	.363	.500	.752	.787	.134
	N	231	231	231	231	231	231	231	231	231	231	231	231	230	231	231	231

**. Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed)

Legend: Pearson Corr. = Pearson correlation coefficient, Factor 1 = average intimacy / personal connection, Factor 2 = average use/dependence, Factor 3 = average familiarity/expertise, Factor 4 = average efficacy/effectance, Factor 5 = average self-identity, Factor 6 = average control, SP Use = average smartphone use, Pos. Mood = average positive mood check items, Neg. Mood = average negative mood check items, BIS = average BIS, BAS = average BAS, SP Age = age when participant got a smartphone, SP Months = number of months participant has owned current device, SP Funct = smartphone functionality, SP Sastis = smartphone satisfaction, SP Ten. = years participant has been a smartphone user.

All of the factors except for Factor 6 (Control) positively correlate with self-reported level of smartphone use (Factor 1: $r = .37$, $p = .00$; Factor 2: $r = .53$, $= p = .00$; Factor 3: $r = .47$, $p = .00$; Factor 4: $r = .40$, $p = .00$; Factor 5: $r = .41$, $p = .00$) indicating that those who report using their smartphone more have higher levels of SPO on all of the factors except for Factor 6 (Control). This is counterintuitive in that it seems likely that those who report using their smartphone the most would be the least willing to let others use their device, especially for an entire day. This may lend support for the idea that the reverse scored items were perhaps misinterpreted by some participants or performed poorly for some other reason.

Factors 1 ($r = -.17$, $p = .01$), 2 ($r = -.25$, $p = .00$), 3 ($r = -.29$, $p = .00$), and 5 ($r = -.21$, $p = .00$) all negatively correlate with age at which a user first got a smartphone indicating that those who got a smartphone at a younger age now have higher levels of SPO on those four factors. Surprisingly, however, none of the factors significantly correlate with smartphone tenure (the number of years that a person has been a smartphone owner/user). This is surprising since smartphone tenure is partly a function of the age at which a person first became a smartphone user.

I had anticipated that Factor 3 (Familiarity/Expertise) would be positively correlated with the number of months that a person had owned their current device, but these two were not significantly correlated. Also somewhat surprising, Factor 3 did not positively correlate with functionality. Factor 3 did however correlate with smartphone satisfaction ($r = .15$, $p = .02$) indicating that those who scored higher on the familiarity/expertise items also reported being more satisfied with their smartphone. Interestingly, smartphone functionality only correlated with Factor 4

(Efficacy/Effectance) (r = .17, p = .01), which is to be expected. Those who reported being able to accomplish a lot as a result of using their smartphone also tended to report that their smartphone functions well. Satisfaction on the other hand, in addition to correlating with Factor 3, also correlated with Factors 1 (r = .17, p = .01), Factor 4 (r = .17, p = .01), and Factor 5 (r = .15, p = .03). Thus, those who scored higher in intimacy/personal connection, familiarity/expertise, efficiency/effectance, and self-identity all also reported higher levels of smartphone satisfaction. In other words, neither use/dependence nor control positively correlated with smartphone satisfaction, which may lend further support for the idea that had the reverse scored items been worded in a direction consistent with the rest of the scale, items that loaded on to Factor 6 may have loaded instead onto Factor 2.

Factors 1, 2, 3, and 4 all significantly correlate with positive mood (r = .27, p = .00; r = .22, p = .00; r = .19, p = .00; r = .22, p = .00 respectively) but none of the factors correlate with negative mood. It is difficult to say whether higher levels of SPO tend to lead to an overall more positive mood, whether those with higher levels of SPO enjoyed the experiment more, or whether those predisposed to more positive moods also tend to develop stronger feelings of SPO.

Average BIS is significantly positively correlated with four of the six factors: 1 (r = 17, p = .01), 2 (r = .28, p = .00), 5 (r = .15, p = .02), and 6 (r = .15, p = .02). Average BIS is significantly positively correlated with five of the six factors: 1 (r = .24, p = .00), 2 (r = .19, p = .00), 3 (r = .25, p = .00), 4 (r = .27, p = .00), and 5 (r = .24, p = .00). Thus, Factor 6 (control) correlates with BIS but not BAS and Factor 3 (familiarity/expertise) correlates with BAS but not BIS. Given the complex pattern of correlations and the

unexpected main effect of SPO on BIS and BAS observed in both Studies 1 and 2, two additional regression analyses were performed to see specifically which of the dimensions of SPO had the strongest influence on psychological power and therefore may have been driving these unexpected main effects.

A forward step-wise regression was done on both BIS and BAS where each of the six factors were tested as possible predictors and were allowed to enter the model based on the order in which they best predicted the dependent measure (BIS or BAS).

BIS forward step-wise regression. Factor 2 (Use/Dependence) was the first to enter the model. It predicted 7.9% of variance in BIS scores [r^2 = .08, $F\Delta(1, 229)$ = 19.62, p = .00] and significantly predicted BIS scores [b = .15, β = .82, $t(229)$ = 4.43, p = .00] such that a one unit increase on the Factor 2 subscale would predict a .15 increase in BIS scores. No other factors entered the model as significant predictors of BIS. Thus the effect of SPO on BIS appears to be driven exclusively by SPO related to the use/dependence route.

Table 36. Model summary produced by the forward regression on BIS.

Model Summary									
				Std. Error of the Estimate	Change Statistics				
Model	R	R Square	Adjusted R Square		R Square Change	F Change	df1	df2	Sig. F Change
1	.281[a]	.079	.075	.51927	.079	19.623	1	229	.000

a. Predictors (Constant), AVE_Factor2

Table 37. Coefficients produced by the forward regression on BIS.

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.373	.158		15.034	.000
	AVE_Factor2	.154	.035	.281	4.4301	.000

a. Dependent Variable: AVE_BIS

BAS forward step-wise regression. Factor 4 (Efficacy/Effectance) was the first to enter the model. It predicted 7.3% of variance in BAS scores [r^2 = .07, $F\Delta(1, 229)$ = 18.14, p = .00] and significantly predicted BAS scores [b = .08, β = .27, $t(229)$ = 4.26, p = .00] such that a one unit increase on the Factor 4 subscale would predict a .08 increase in BAS scores. Factor 5 (Self-Identity) entered the model next. It predicted and additional 1.8% of variance in BAS scores [r^2 = .09, $F\Delta(1, 228)$ = 4.62, p = .03] and significantly predicted BAS scores [b = .05, β = .15, $t(229)$ = 2.15, p = .03] such that a one unit increase on the Factor 5 subscale would predict a .05 increase in BAS scores. No other factors entered the model as significant predictors of BIS. Thus the effect of SPO on BAS appears to be driven by SPO relating to efficacy/effectance and self-identity motives.

Table 38. Model summary produced by the forward regression on BAS.

Model Summary									
					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.271[a]	.073	.069	.33260	.073	18.144	1	229	.000
2	.303[b]	.092	.084	.33000	.018	4.624	1	228	.033

a. Predictors (Constant), AVE_Factor4

b. Predictors (Constant, AVE_Factor4, AVE_Factor5

Table 39. Coefficients produced by the forward regression on BAS.

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.849	.079		35.980	.000
	AVE_Factor2	.082	.019	.271	4.260	.000
2	(Constant)	2.734	.095		28.765	.000
	AVE_Factor4	.064	.021	.209	3.017	.003
	AVE_Factor5	.046	.021	.149	2.150	.033

a. Dependent Variable: AVE_BAS

Discussion

Taken together, the results obtained both by the regression and MANOVA using the combined dataset are very consistent with those obtained in Studies 1 and 2 individually and seem to indicate that even with a larger sample size, statistically significant support for the main hypotheses were unlikely to be observed using the current design. Both tests indicate a strong relationship between SPO and psychological power, but neither lend support for the predicted two- and three-way interactions based on smartphone custody. Possible reasons for this are discussed in detail in Chapter 7.

The results of the PCA indicate that a six-factor solution is best but that in reality the sixth factor (Control) may not represent a distinct subscale as much as it does the fact that the two items that make up the factor are both reverse scored. It is possible that if they were worded in the direction consistent with the rest of the scale that they may map onto another factor. This would result in a five-factor solution, which is the number of factors initially indicated by the PCA.

The pattern of correlations observed among the factors indicate that they do likely represent distinct underlying constructs that can be captured by subscales. This is also reflected in the various factors found to be predictors of BIS and BAS revealed by the forward regression. Specifically, use and dependence seem to influence levels of BIS while efficacy/effectance and self-identity seem to influence levels of BAS. This is consistent with the more nuanced relationship that people seem to have with their smartphone where some users feel deeply connected to it in a personal sense where others may use and rely on it heavily but as a useful tool for accomplishing tasks. While much work exists to be done on the scale, this analysis has provided a useful first step in

creating a measure to capture the varieties in the type of psychological ownership that users feel toward their smartphones. A good next step would be to construct more items based on the factors revealed by the CFA and do further reliability and validity testing with a larger, more diverse sample of users. Specifically, it is important to include a wider age of smartphone users in follow-up testing as it is likely that college students use and rely on their devices for very different functions than do older users and those who rely on their device for professional purposes.

CHAPTER VII

GENERAL DISCUSSION

Summary

The two studies conducted in this dissertation sought to test whether access to an individual's smartphone influenced that person's level of psychological power, and if, in turn, that person's level of psychological power had behavioral implications. Study 1 tested the prediction that those allowed access to their smartphone would exhibit higher levels of psychological power than those denied access to their smartphone, and that the effect of smartphone access on psychological power would influence risk-taking behavior and moral orientation such that those in the smartphone access condition would take more risks and show a relative preference for a rule-based moral decision making schema while those in the smartphone deprivation condition would take fewer risks and show a relative preference for an outcome-based moral decision making schema. Study 1 also tested the prediction that the effect of smartphone custody on psychological power would be moderated by an individual's level of smartphone psychological ownership (SPO). Results of Study 1 fail to provide compelling support for any of these predictions.

Study 2 tested the similar predication that those allowed access to their smartphone would exhibit higher levels of psychological power than those denied access

to their smartphone, and that the effect of smartphone access on psychological power would influence cheating behavior such that those in the smartphone access condition would cheat more than those in the smartphone deprivation condition. Likewise, Study 2 also tested the prediction that the effect of smartphone custody on psychological power would be moderated by an individual's level of SPO. Results of Study 2 fail to provide compelling support for any of these predictions.

Initially, it would seem natural to conclude that the predictions were incorrect and that smartphone access does not influence a user's level of psychological power. However, this would stand in complete contradiction to the earlier findings by Egan and Larson (2015) that did find that smartphone access increased psychological power. In that study, a behavioral, and arguably superior measure of psychological power was used. Also in that study, a considerably longer period of time (approximately 5 to 10 minutes) passed between the smartphone custody manipulation and the measure of psychological power (as opposed to 30 to 90 seconds in the current study). These two important differences likely account for the differences in findings. These are discussed in more detail below as limitations.

Another possibility that bears consideration is that embodiment effects resulting from actual smartphone use resulted in lowered level of psychological power among those in the smartphone access condition. Bos and Cuddy (2013) found that while using a smartphone, users tend to assume a small, closed posture that results in a decreased in psychological power. As those in the smartphone deprivation condition were prevented from using their device while those in the smartphone access condition were not, and indeed many were observed to use their device during the experiment, it is possible that

those in the smartphone access condition may have experienced lower levels of psychological power resulting from an embodiment effect. If so, levels of power observed in all but the smartphone deprivation condition would be expected to look very similar, because all participants except those in the smartphone deprivation condition had access to and likely used their devices. In reality, Study 2 found that levels of BAS were the same in both the smartphone access and student ID deprivation conditions, and that while BAS was lower among smartphone access participants than smartphone deprivation participants, it was also lower among student ID deprivation participants compared with student ID access participants. Thus, no coherent, theoretically-based, rationale appears to explain the unexpected direction of the significant object-by-custody interaction on BAS observed in Study 2. And again, this explanation too would stand in contradiction to the earlier findings by Egan and Larson (2015) as the same possibility would have existed in that study but was not observed.

Thus, it seems more likely that limitations common to both Studies 1 and 2 account for the lack of support for any of the predictions.

Limitations

The two most significant limitations of the current dissertation pertained to the measure of psychological power used and the order of procedures. Unfortunately, both limitations were present in both Study 1 and Study 2. Each will be discussed in more detail below.

Measure of Psychological Power

Measures of psychological power vary widely including both self-report and behavioral measures. While behavioral measures are generally preferable in

psychological research and specifically for measuring psychological power, I decided to use a self-report measure in the current study. I made this decision because behavioral measures were already being employed in both Study 1 (risk taking) and Study 2 (cheating) and both involved financial decisions. The earlier study by Egan and Larson (2015) used a behavioral measure with financial implications. Specifically, in that study, participants were asked to participate in a shared-resource game wherein they took points for themselves. Those points were said to determine the number of raffle entries that a participant would receive. Because that measure was so similar to especially the dependent measure of cheating behavior (used in Study 2), it seemed likely that using it might either 1) interfere with the similar and subsequent dependent measure, and/or 2) raise suspicion among participants. Using that same measure would also produce uncertainty as to whether psychological power or another psychological mechanism were truly driving the effect.

Another behavioral measure that could have been used was a participant's decision to act to reduce or remove some unpleasant condition in the environment. For instance, Galinsky et al. (2003) measured power by whether or not participants acted to turn off or redirect an irritating fan blowing in the participant's direction. Bos and Cuddy (2013) operationalized power as the amount of time that a participant spent waiting for an ostensibly tardy research assistant to return. However, both of these measures of power require that participants take part in the study one at a time. For instance, witnessing another participant get up to move or turn off the fan or to retrieve the research assistant will influence the behavior of other participants present, introducing another source of variance (i.e., conformity). Yet, psychological power is a socially

dependent construct so the real or imagined presence of others is needed to make salient differences in one's level of psychological power. Specifically, in this study, the idea of losing and thus being without the resources afforded by the smartphone and the relative power differential between those with and without their smartphone was believed to be necessary in order to observe the anticipated effects.

There are means of priming thoughts of a social context when running participants individually, but it is unlikely that any such prime would have been as strong as collecting data in a group setting with the actual presence of others. Thus, a self-report measure of psychological power seemed preferable for three reasons. First, in the current studies it was less likely to interfere with subsequent dependent measures. Second, it was anticipated to be a more direct measure of psychological power in that it did not depend on as many inferences being made regarding the cause (psychological mechanism) of the behavior being used as a proxy of one's level of psychological power. Third, it allowed data to be collected while participants were in the presence of others thus fulfilling the need to measure psychological power in a social context.

When choosing a self-repot measure of psychological power for the current dissertation, several options were considered. For instance, I considered using Anderson's et al. (2012) Personal Sense of Power Scale or a "ladder" scale similar to the one used by Adler, Epel, Castellazzo, and Ickovics (2000) (each discussed in more detail below). Ultimately, Carver and White's (1994) BIS/BAS Scales seemed to have received the most reliability and validity testing (e.g., Cooper, Gomez, & Aucote, 2007; Heubeck, et al., 1998; Jorm, et al., 1999), and to be the measure that most closely aligned with the

theoretical framework for psychological power (Approach/Inhibition theory of psychological power) being used as a basis for the predictions of the current study.

In retrospect, using this measure for the current study appears to have presented at least two limitations. The most significant is that it often did not reliably relate in predictable ways with the dependent measures. Specifically, research has routinely found that heightened levels of psychological power are associated with greater amounts of risk-taking (Keltner, et al., 2003) and cheating (e.g., Lammers, et al. 2011). While in a few instances, BIS and BAS scores were found to predict outcomes consistent with previous research (e.g., BIS predicted amount wagered in Study 1), more often the typical effects of power on risk taking and cheating were either inconsistent or lacking. This seems to suggest that, rather than an entire body of literature being wrong, the BIS/BAS Scales of psychological power were not entirely effective in the current studies.

One of the other self-report scales considered might have been preferable – although both are more transparent. The Personal Sense of Power Scale (Anderson, et al., 2012) is an eight-item measure that asks relatively straightforward questions such as "If I want to, I get to make the decision" and "I think I have a great deal of power". The "ladder" scale (Adler, et al., 2000) is a simple one-item measure wherein participants are provided a drawing of a ladder with 10 rungs and asked to "place an 'X' on the run that best represents where they think they stand on the ladder." (p. 587) The rungs are said to represent a person's place in society with higher status members at the top and lower status members at the bottom. Both the simplicity and high face validity of these measures make it likely that either would have been a superior measure of psychological power. However, the high face validity also may have increased the likelihood that

participants would be able to guess the true nature of the study and the predictions, which may have introduced a new set of limitations.

Order of Procedures

In the earlier work by Egan and Larson (2015) that initially made the connection between smartphone custody and psychological power, custody of one's smartphone was manipulated relatively early in the session (just after informed consent and just before the measure of smartphone use and SPO). Thus, participants experienced the custody manipulation for approximately 10 minutes prior to participating in the measure of psychological power. In the current study, smartphone custody was manipulated immediately preceding the measure of psychological power. Thus, participants only experienced the custody manipulation for approximately 30 to 90 seconds prior to completing the measure of psychological power.

It is possible then that the studies in this dissertation have identified an important boundary condition; namely, that the effects of smartphone custody on psychological power are not immediate but rather require a minimum amount of time to emerge or that they grow stronger with time. If this were the case, effects on the later dependent measures (risk taking, moral orientation, and cheating) should have revealed the effect in that more time had passed before these measures were completed. Because this was not consistently the case, it is difficult to speculate with confidence as to whether a longer time between the smartphone custody manipulation and the measures of psychological power would have made a difference. It is possible that the entire duration of the studies was not long enough to observe the effect. Because each study only lasted on average 25 to 45 minutes (for Study 2 and Study 1 respectively) and because the custody

manipulation did not occur until half-way through the session, all of the dependent measures were collected relatively shortly after the custody manipulation.

At the least, both limitations should have been minimized by the use of multiple dependent measures. If risk taking, cheating, and moral orientation are valid behavioral proxies for psychological power, and because these measures were taken at multiple temporal points following the custody manipulation, it is difficult to say why the earlier findings by Egan and Larson (2015) were not replicated in either of the current studies. Thus, the most likely scenario is that the overall length of the experimental sessions was too short and that custody should have either been manipulated earlier in the session, or a filler-task should have been included to allow sufficient time for the effect to develop.

Statistical Power

Lastly, there is always the possibility that the study lacked statistical power. One common cause of low statistical power is an insufficient number of observations. This possibility was discussed and largely ruled out in Chapter 6. Specifically, two steps were performed to evaluate the potential impact of this limitation. First, data in common from Studies 1 and 2 were combined resulting in a much larger data set. Even with this larger data set, no differences on psychological power (either BAS or BIS) were observed based on smartphone custody. Second, a post hoc power analysis was conducted based on the observed effects sizes. This analysis revealed that 7,598 participants would have been needed in order to observe the effect. As this is an unrealistically large number for a laboratory study, power needs to be increased by making modifications to the experimental design for instance either to increase the strength of the manipulation, or to increase the sensitivity or validity of the measures use. Together, these additional

analyses suggest that, while statistical power was low, it was not likely due to an insufficient sample size but rather to methodological flaws in the design.

Ecological Validity

This study was interested in the difference in psychological power between those in the smartphone access and the smartphone deprivation condition; however, both of these scenarios are a departure from the normal. While users do often have access to their device, they are not often in a situation where they witness others having their device taken from them. Similarly, while certain social norms limit one's access to their smartphone in certain situations (e.g., classrooms, board rooms, movie theatres), users do not often have their device physically taken from them for any length of time. Thus, both conditions lack a degree of ecological validity in that they do not perfectly reflect real-life usage scenarios.

Scope

This design does not shed light onto the fundamental question as to whether smartphone access actually *increases* psychological power or whether smartphone deprivation actually *decreases* psychological power – only whether there is a difference in the level of psychological power between the two conditions. In other words, the current design does not allow for a true comparison between a neutral or baseline condition. People adapt to their normal frame of reference (e.g., Helson, 1948). When a user first acquires a smartphone, he or she may experience a shift, presumably an increase, in psychological power resulting from having acquired access to so many valuable resources through a single device. Similarly, when a user first loses his or her smartphone (either because they choose to give it up, or it is lost or stolen) he or she may

experience a shift, presumably a decrease, in psychological power resulting from having lost access to so many valuable resources simultaneously. Both of these are novel states compared with the everyday experience of owning a smartphone wherein a user takes for granted the resources afforded by the device. It makes sense that upon initial acquisition or loss of a smartphone, this new access or lack thereof would result in an increase or decrease in a user's sense of psychological power. But, it is less apparent how temporary access to or deprivation from one's smartphone may result in an increases or decreases in psychological power. This question largely depends on the reference point to which the comparison is made. If the user's baseline level of psychological power (trait psychological power) is influenced by long-term use, as is indicated by the results of the current dissertation, then access to the device may not result in an actual increase in power as much as being deprived access to the device results in a decrease in power as that is the more novel situation. The question as to whether smartphone access *increases* and/or smartphone deprivation *decreases* psychological power would best be addressed using a longitudinal study. At a minimum, it would require a pre- and post-custody-manipulation measure of psychological power. An ideal design would allow for comparison to one's level of psychological power before he or she first acquired a smartphone so that both the long-term and short-term effects of smartphone custody could be investigated.

Implication

Theoretical Implications

Psychological power. While no support was found for the prediction that immediate smartphone custody influences psychological power, a consistent pattern

emerged wherein SPO influenced levels of both BIS and BAS. Supplementary analysis identified various dimensions of SPO that were specifically related to feelings of BIS as opposed to BAS. As SPO is related to long-term or chronic levels of smartphone use and ownership, this does provide some evidence for the overall proposed relationship between smartphone use/ownership and psychological power. Specifically, it would seem that prolonged and habitual use of one's smartphone may be associated with higher levels of trait psychological power. However, it is equally likely that those higher in trait levels of psychological power are more inclined to use their device more and develop stronger feelings of psychological ownership toward it. Much more research is needed to fully understand this relationship, but the current studies provide compelling evidence that some positive relationship does exist between SPO and psychological power; however, does not provide sufficient information to indicate a causal relationship between the two.

Psychological ownership. In addition to indicating that SPO plays an important role in psychological power, these studies also yielded a better understanding of the subscales and dimensions that underlie SPO. The identified subscales map well onto the theoretically proposed routes and motives of psychological ownership (Pierce, et al., 2003), but also reflect some aspects that appear to be unique to smartphones as a target of psychological ownership. While it is likely that the routes and motives implicated in feelings of psychological ownership toward other target objects vary slightly from the dimensions identified here, this study has made several important contributions. First, it has revealed the routes and motives that are likely important in developing feelings of psychological ownership toward smartphones. Second, it has provided a model for

developing scales to measures feelings of psychological ownership toward other target objects. Third, it suggests that Pierce's et al. (2003) theory of psychological ownership possesses construct validity and has predictive value.

Empirical Implications

Risk taking. The current study sought to replicate earlier findings regarding the behavioral implications of higher and lower levels of psychological power on risk taking (e.g., Carney, et al., 2010). The effects of psychological power on risk taking are robust (e.g., Keltner, et la., 2003; Carney, et al., 2010) however the current study provided mixed results on this dependent measure. While the expected relationship between BIS scores and risk taking were observed in Study 1, the same was not true of BAS and risk taking. However, as was mentioned above in the Limitations section, failing to replicate this robust effect is far more likely due to limitations regarding the BIS/BAS Scales or methodological flaws in the design as opposed to indicating that the previous findings are invalid.

However, the significant main effect of order on risk taking does have empirical implications for this literature. Knowing that the proximal distance between risky decisions and the event deciding their outcome influences risk-taking behavior has many interesting applications. Sometimes, risky decisions are made immediately before the potential pay-off; for instance, while gambling in a casino. Other times, risky decision are made far in advance of the potential positive or negative outcome. In fact, this is likely the more common scenario. Consumers decide whether and how much life, health, or homeowner's insurance to purchase far in advance of any anticipated need. College students make decisions regarding the use of contraceptives and condoms weeks or

months before the time at which they will learn whether there were negative outcomes associated with their risky sexual behavior. Investors buy stocks sometimes anticipating waiting months or years to know whether theirs was a good investment.

Study 1 found that those who engaged in risky behavior closer to the time of the potential pay-off were more willing to take risks. McElroy and Mascari (2007) found that when risky decisions were made closer to the time at which the outcome of the behavior was to be made known, participants used a more analytic decision-making approach. However, when risky decisions were made further from the time at which the outcome of the behaviors was to be made known, participants used a more holistic or heuristic decision-making approach. In light of their findings, these results are somewhat surprising. It seems more likely that those who wagered earlier (in the moral orientation first condition) would use a heuristic approach, perhaps leading them to be more optimistic and to wager more, while those who wagered later (in the risk taking first condition) would use a systematic approach, perhaps leading them to correctly assess the odds of winning as 50% and to wager less. This is the opposite of what was found. However, processing style would be expected to interact with psychological power such that those using a heuristic processing style would be more influenced by their level of psychological power meaning that those who wagered earlier and who felt a higher level of psychological power would be especially optimistic about their odds of winning (as high-power individuals tend not to attend to possible negative outcomes). On the other hand, those who wagered earlier but felt lower levels of psychological power would be more risk-adverse and less likely to wager as much. Admittedly, the potential gains and losses in the current study were fairly small, but the apparent inconsistency between the

findings of McElroy and Mascari (2007) and the results of this study are interesting and would be an interesting avenue for future research.

Moral orientation. In particular, I was interested in whether the findings by Lammers and Stapel (2009) would replicate. Lammers and Stapel (2009) found that elevated levels of psychological power were associated with a deontological (rule-based) moral orientation whereas lowered levels of psychological power were associated with a consequentialist (outcome-based) moral orientation. Given the novelty of their finding, the fact that it appears to be as-of-yet un-replicated, and because of the large number of studies authored by Diedrik Stapel that were eventually retracted, replicating their finding was of special interest (compared with the other relatively well-replicated findings regarding the effects of power on cheating and risk taking).

The results of Study 1 provide mixed support for the findings of Lammers and Stapel (2009). The moderated mediation analysis did not find that either BIS or BAS predicted moral orientation; however, a significant correlation was observed between BAS and moral orientation indicating that higher power participants favored a rule-based or deontological moral orientation, which is consistent with Lammers and Stapel (2009). Thus, weak support for their findings was observed, but the results remain inconclusive and additional research is still needed to confidently replicate their findings regarding the effect of power on moral orientation.

Societal Implications

Limitations of the current dissertation that likely led to a lack of support for the predictions makes it difficult to confidently draw societal implications. If the lack of support actually indicates a lack of an effect of smartphone custody on psychological

power, then smartphone users need not worry about how access to one's device may influence their level of psychological power. This does not however indicate that access to one's device may not influence other important psychological experiences such as self-efficacy and emotion regulation. Additional research is needed to further investigate the possibility that smartphone access influences other psychological mechanisms such as those.

If the lack of support is, as suspected, the result of significant limitations then users are cautioned to think carefully about how smartphone access may influence his or her level of psychological power. Compelling theoretical evidence was provided in Chapter 2 suggesting that because of the access to valuable resources afforded by this device, access to one's smartphone may increase a user's level of psychological power. Increased levels of psychological power often lead to undesirable behaviors such as cheating and behaving antisocially. Additional research is needed to investigate these predictions, but results by Egan and Larson (2015) suggest that the relationship between smartphone access and power does exist making this the more likely of the two scenarios. Thus, users are cautioned to be mindful of when and where they permit themselves access to their device. At times, smartphone-induced power may be highly desirable. For instance, when trying to attain a desired goal like exercising or achieving work goals, smartphone-induced power may be beneficial (so long as the device does not serve as a distraction). At other times however, specifically when the opportunity to engage in undesirable behaviors exists (e.g., texting while driving, failing to attend to one's partner or children), a user may choose to deprive him or herself custody of their device.

Also, while immediate effects of smartphone custody on psychological power were not observed, evidence was observed that indicates a strong relationship between SPO and psychological power. As users become accustomed to having access to the tools and resources afforded by their smartphone, they may experience a gradual and cumulative increase in their sense of psychological power. Similarly, as smartphone users "sharpen their tool" by becoming more competent and efficient users and by adding useful mobile applications they may experience an increase in their trait level of psychological power resulting from the knowledge that (a) they have access to these valuable resources and (b) they feel a sense of mastery in using this tool. As such, users should be vigilant to changes in their behavior over time reflected in the type and amount of smartphone usage. As it can be especially difficult to notice gradual changes in oneself, I urge users to occasionally take an intentional break from using their device as an opportunity to observe intra- and interpersonal differences between periods of use and non-use. Several researchers are working on valid and reliable scales to assess smartphone addiction and dependence (e.g. Roberts, Yaya, & Manolis, 2014; Pavia, Cavani, Di Blasi, & Giordano, 2016). Scales like these may help users objectively assess their smartphone use and dependence and hopefully to make informed decisions about how best to benefit from this useful tool while minimizing the possible negative side effects resulting from overuse.

As discussed earlier, psychological power does not necessarily corrupt (Chen, et al., 2001; Overbeck & Park, 2001) and, depending on the person and the situation, can often lead to action taking in the form of prosocial behavior. If then, resulting from certain types of smartphone use, users are developing high levels of SPO which is leading

to higher trait levels of psychological power, we, as a society may be poised not only to behave more antisocially, but also more prosocially. If these tools can be used to coordinate the efforts of users worldwide, and can serve to individually empower users to take action, then they could play a critical role in addressing national and global problems in a way that other technologies, like television and social media, may not. The ability to realize this possibility rests with researchers and developers. Researchers need to understand how smartphone use influences users at a basic, psychological level, the features of the user and technology that are critical to influencing behavior, and how the individual and environmental factors work together to produce behavior. Developers, armed with this knowledge, need to heed the call of those like Gleason (2009) to design technologies that will increase users' autonomy, empower them, and ultimately allow people to be the best version of themselves instead of the chronically-distracted, over-taxed versions of themselves that many report feeling that they have become as a result of their smartphones.

In summary, despite a lack of support for the current predictions, the observation that smartphone use often coincides with bad behavior is still valid and bears investigation. Either psychological power is impacted and is at least in part the psychological mechanism causing these bad behaviors, in which an alternate design is needed to detect the effect, or some other psychological mechanism is at work, in which an alternate theoretical framework is needed to understand these effects. Either way, additional research is needed.

Future Directions

As a first step, I would like to follow up the current study with a close replication of this dissertation that corrects the two main limitations by using a different measure of psychological power and by allowing longer between the smartphone custody manipulation and the collection of the dependent measures. Procedurally, this replication may look more similar to the initial study conducted by Egan and Larson (2015).

Also, I would like to investigate the potential for smartphone-induced power to influence behavior, and specifically moral behavior, in a positive way. Because increased levels of psychological power promote action taking in general, rather than promoting bad behavior in particular (Keltner, et al., 2003) it should be equally likely that smartphone-induced power can promote good behavior. Previous research has demonstrated that high power is more likely to be associated with bad behavior only because as a default people tend to focus on their own outcomes, which are often at odds with the outcomes of others. For instance, in the previous study by Egan and Larson (2015), action taking meant taking more of a shared resource for oneself, necessarily leaving less of that fixed commodity for others. However, when the possibility of behaving prosocially is made salient or thoughts of responsibility and/or the needs of others are primed along with power, high power individuals are equally likely to engage in prosocial behavior (Overbeck & Park, 2001). A near replication of Study 1 with a minor modification to the dependent measure of risk-taking would be well suited to testing this prediction. Rather than giving participants the opportunity to wager some of their compensation to potentially increase their earnings, I would give participants the opportunity to donate some of their compensation to a charity. If smartphones do

increase psychological power, high power individuals would be expected to be more likely to act on the opportunity to make a charitable contribution.

Another useful modification to the current design would be to strengthen the custody manipulation. For instance, dyads could be used wherein participants actually hand over either their smartphone or student ID to the other member of the dyad so that one participant holds both smartphones and one holds both IDs. The power differential resulting from access to different resources would be much more pronounced using such a manipulation. Similarly, using a task wherein the smartphone would actually be a useful tool towards its completion would make the lack of (or access to) resources resulting from smartphone deprivation (access) more salient.

As a next step toward further validating the scale of SPO I would like to see whether the scale corresponds with actual smartphone use and checking behaviors. To do so, I would conduct a field study relying on behavioral observation. Unobtrusive observations would be made of potential participants in settings such as a coffee shop or library. Observers would record smartphone use and checking behavior for a fixed length of time. For instance, behaviors may include touches of the device, total time spent using the device, and distance between user and device. The theory of psychological ownership (Pierce, et al., 2003) would predict that each of these behaviors would be positively associated with higher levels of psychological ownership of the device. After the observation period, I would approach potential participants and ask them if they would be willing to complete the scale of SPO. Theoretically, those who engage in more use and checking behavior would be expected to score higher on the scale. This would make two important contributions toward validating the measure. First, current studies

wherein the measure has been used have involved only college-age samples of participants. By making observations in coffee shops and libraries, a more representative community sample with a more diverse age range could be accessed. Second, thus far, the measure has been compared with other self-report measures (e.g., smartphone use, length of ownership, smartphone functionality and satisfaction). This would allow the scale to be compared with actual user behavior.

In the same or a conceptually similar study, it would also be of value to include a measure of phubbing behavior (snubbing physically-present others as a result of one's smartphone use). Those who check and/or use their smartphone more would be expected to engage in higher levels of phubbing behavior for two reasons. First, keeping the device nearer and checking and/or using it more often would be expected to serve as a frequent reminder of access to the valuable resources afforded through the device. Thus, those individuals would be expected to experience higher levels of psychological power causing a greater focus on his or her own needs and desires rather than on those of his or her companion. Presumably, this would result in more frequent instances of phubbing. Second, greater levels of psychological attachment to one's device would be expected to promote more frequent and prolonged use of the device which should also lead to more incidental phubbing behavior. Thus, in addition to administering the scale of SPO after the observation period, it would be beneficial to administer a measure of phubbing behavior to those participants who are observed as a part of a dyad or small group. While the field study described would not directly replicate the predictions tested in the current dissertation, it would complement the earlier findings by Egan and Larson (2015) as well as providing additional validation of the measure of SPO.

Finally, to address the conceptual question raised earlier regarding whether differences in psychological power between those with access to or those deprived of access to their smartphone results from an increase associated with access or a decrease associated with deprivation, a longitudinal study would be of value. Ideally, trait levels of psychological power would be obtained from all participants in advance. Then, during a laboratory study, custody of one's device would be manipulated and state levels of psychological power would be taken at various temporal points following the custody manipulation. This would allow immediate and cumulative effects of custody to be compared to, or controlling for, trait levels of psychological power. If I were to also use a within-subjects design, levels of psychological power following access or deprivation could be compared for the same individual which would also for the observation of changes in psychological power among those who had previously been deprived of their device but were later allowed access to their device again.

Conclusion

The current study remains inconclusive regarding the potential impact of smartphone access on users' level of psychological power. Earlier work suggested that access to an individual's smartphone does increase that person's level of psychological power (Egan & Larson, 2015), but limitations of the current study prevented me from successfully replicating those earlier findings. These studies did however reveal that SPO appears to play a significant role in levels of BIS and BAS. While the results of the current study do not provide much insight into the short-term effects of smartphone custody on psychological power, they do appear to indicate an effect of long-term or chronic smartphone use on psychological power.

Finally, this study did make a significant contribution in replicating and further demonstrating the potential usefulness of the measure of SPO. As smartphone use continues to be a prevalent behavior and other wearable smart technologies (e.g., smart watches, smart glasses, and smart jewelry) enter the social landscape, the demand and importance for valid and reliable measures to assess users' relationships with these devices will only grow. Hopefully, this scale will continue to develop into one that will be useful in many related veins of research in the future.

APPENDIX A

DATA COLLECTION MATERIAL PACKET USED IN STUDY 1.

The next 10 pages are the paper-and-pencil participant material packet used in Study 1. The version included is the smartphone deprivation, moral orientation first, moral outcome accept condition.

Loyola University Chicago

STUDY OF COLLEGE STUDENTS' SMARTPHONE USE

Experiment: 2773

Spring, 2016

Part 1: Instructions

You will be asked to complete a series of questionnaires. At the bottom of each page will be instructions indicating either to stop and wait for further instruction before proceeding or to proceed to the next page. Please look for these instructions at the bottom of each page and follow them carefully.

Also, as a part of your compensation for participating today, in addition to the two experimental credits you will earn, you will be monetarily compensated. Later during the experiment, you will be given the opportunity to participate in a Double-or-Northing game in order to determine how much money you will receive for your participation.

Please wait. The Experimenter will instruct you when it is time to turn the page. Thank you!

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

Smartphone User Attitudes Scale

Please indicate how true each of these statements is for you. Place a mark inside one circle per row indicating the choice that is most applicable.

	1 = Definitely Not True	2	3	4	5	6 = Definitely True
I have a lot of personal information stored on my smartphone.	◯	◯	◯	◯	◯	◯
My smartphone reflects my personality.	◯	◯	◯	◯	◯	◯
My smartphone makes me feel connected to home wherever I am.	◯	◯	◯	◯	◯	◯
I feel like I've gotten to "know" my smartphone like one does a friend.	◯	◯	◯	◯	◯	◯
Other people often use my smartphone.	◯	◯	◯	◯	◯	◯
I spend a lot of time using my smartphone.	◯	◯	◯	◯	◯	◯
I am very possessive of my smartphone.	◯	◯	◯	◯	◯	◯
I always have my smartphone with me.	◯	◯	◯	◯	◯	◯
I would be willing to let a friend borrow my smartphone for the day.	◯	◯	◯	◯	◯	◯
My smartphone is extremely useful in helping me achieve my goals.	◯	◯	◯	◯	◯	◯
I know how to use all of the features of my smartphone.	◯	◯	◯	◯	◯	◯
I have taken a lot of time to personalize my smartphone.	◯	◯	◯	◯	◯	◯
My smartphone makes me feel more capable.	◯	◯	◯	◯	◯	◯
I am very familiar with my smartphone.	◯	◯	◯	◯	◯	◯
My smartphone is an extension of myself.	◯	◯	◯	◯	◯	◯
I would feel lost without my smartphone.	◯	◯	◯	◯	◯	◯
My smartphone is a kind of "home-away-from-home."	◯	◯	◯	◯	◯	◯
I am able to accomplish a lot more as a result of having my smartphone.	◯	◯	◯	◯	◯	◯

➔ **PROCEED.** Go ahead and proceed to the next page. Thank you!

Smartphone Use Questionnaire

We are interested in learning more about how college students user their smartphones. Please provide some information about your smartphone and how you use it.

1. To what extent do you rely on your phone for each of the following? Indicate your choice by placing a mark in one circle per row.

	0 = Not at All	**1**	**2**	**3**	**4**	**5 = To a Great Extent**
Accessing the Web	◯	◯	◯	◯	◯	◯
Sending/Receiving Emails	◯	◯	◯	◯	◯	◯
Social Media	◯	◯	◯	◯	◯	◯
Making/Receiving Phone Calls	◯	◯	◯	◯	◯	◯
Listening to Music	◯	◯	◯	◯	◯	◯
Sending/Receiving Text Messages	◯	◯	◯	◯	◯	◯
Maps/Location Services	◯	◯	◯	◯	◯	◯
Shopping	◯	◯	◯	◯	◯	◯
Playing Games	◯	◯	◯	◯	◯	◯
Calendar/Reminders	◯	◯	◯	◯	◯	◯
Watching Videos	◯	◯	◯	◯	◯	◯
Taking Photos/Videos	◯	◯	◯	◯	◯	◯
Other Applications (Finance Apps, Fitness Apps, etc.)	◯	◯	◯	◯	◯	◯

2. What make (iPhone, Android, etc.) and model (5s, Galaxy s5, Droid Turbo, etc.) of smartphone do you have? _____
3. At what age did you first get a smartphone? _____ years old.

4. How many months have you owned your <u>current</u> smartphone? _____ months.

➔ **PROCEED.** Go ahead and proceed to the next page. Thank you!

5. On a scale of 1 to 10, 1 being that your phone does not work at all and 10 being that your phone works perfectly, how well does your current phone function?

1 = Not At All	2	3	4	5	6	7	8	9	10 = Perfectly
○	○	○	○	○	○	○	○	○	○

6. On a scale of 1 to 10, 1 being completely dissatisfied and 10 being completely satisfied, how satisfied are you with your current phone?

1 = Completely Dissatisfied	2	3	4	5	6	7	8	9	10 = Completely Satisfied
○	○	○	○	○	○	○	○	○	○

7. What is your biological sex?

   ○ Female

   ○ Male

   ○ Other / Prefer Not to Reply

8. What is your age? _____

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

Part 2: Instructions

Before we continue, please be sure to silence your mobile phone, and place it in the clear container provided by the experimenter. Later in the experiment, you will be asked for some information which you may be tempted to obtain from your mobile phone. For this reason, we are asking you to place your phone in the clear container on the table at the front of the room where you will not be able to access it.

Once you have completed this step, please wait until the experimenter instructs you to proceed.

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

BIS/BAS

Please indicate how much you agree with each of the following statements. Place a mark inside one circle per row indicating the choice that is most applicable.

	1 = Strongly Disagree	2	3	4 = Strongly Agree
When I go after something, I use a "no holds barred" approach.	◯	◯	◯	◯
I worry about making mistakes.	◯	◯	◯	◯
When good things happen to me, it affects me strongly.	◯	◯	◯	◯
When I'm doing well at something, I love to keep at it.	◯	◯	◯	◯
When I see an opportunity for something I like, I get excited right away.	◯	◯	◯	◯
I'm always willing to try something new if I think it will be fun.	◯	◯	◯	◯
I have very few fears compared to my friends.	◯	◯	◯	◯
I feel worried when I think I have done poorly at something.	◯	◯	◯	◯
I go out of my way to get things I want.	◯	◯	◯	◯
When I want something, I usually go all-out to get it.	◯	◯	◯	◯
I feel pretty worried or upset when I think or know somebody is angry at me.	◯	◯	◯	◯
If I see a chance to get something I want, I move on it right away.	◯	◯	◯	◯
Even if something bad is about to happen to me, I rarely experience fear or nervousness.	◯	◯	◯	◯
When I get something I want, I feel excited and energized.	◯	◯	◯	◯
I often act on the spur of the moment.	◯	◯	◯	◯
Criticism or scolding hurt me quite a bit.	◯	◯	◯	◯
It would excite me to win a contest.	◯	◯	◯	◯
I crave excitement and new sensations.	◯	◯	◯	◯
If I think something unpleasant is going to happen, I usually get pretty "worked up."	◯	◯	◯	◯
I will often do things for no other reason than they might be fun.	◯	◯	◯	◯

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

Social Decision-Making

Please read the following story carefully and answer the question that follows.

Carol, a high school girl, has promised to help her friend Corinne with a personal problem, when she is asked by Tina, a new girl in her class, to go to the theater with her, at the same time. Carol has to decide between being loyal to her old friend and being nice to the new girl. Ultimately, Carol decided to accept Tina's offer and to break her promise to Corinne. Suppose you had advised her to do so (i.e., to accept Tina's offer to visit the theater and to break her promise to her friend Corinne). Of the two reasons provided below, which would be the better reason for that decision? Read the two reasons provided and indicate your choice by placing a mark in one of the circles below.

The reason, "Tina needs new friends at her new school; otherwise she will feel lonely and left out" is better	○ ○ ○ ○ ○ ○ ○ ○ ○	The reason, "It is generally a good rule to welcome in and be friendly to new people." is better

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

Double-or-Nothing Game Entry Form

1. Please indicate whether or not you would like to enter the Double-or-Nothing Game by circling either "Yes" (to enter) or "No" (to opt out) below:

Yes No

2. Only if you chose to enter the Double-or-Nothing Game, please indicate how much you would like to wager by placing a check mark in one of the boxes below:

□ $0.25	□ $1.25	□ $2.25
□ $0.50	□ $1.50	□ $2.50
□ $0.75	□ $1.75	□ $2.75
□ $1.00	□ $2.00	□ $3.00

Potential Compensation Outcomes

Amount Wagered	Winning Outcome	Losing Outcome
$0.25	$3.25	$2.75
$0.50	$3.50	$2.50
$0.75	$3.75	$2.25
$1.00	$4.00	$2.00
$1.25	$4.25	$1.75
$1.50	$4.50	$1.50
$1.75	$4.75	$1.25
$2.00	$5.00	$1.00
$2.25	$5.25	$0.75
$2.50	$5.50	$0.50
$2.75	$5.75	$0.25
$3.00	$6.00	$0.00

3. Only if you chose to enter the Double-or-Nothing Game, please circle the outcome that you would like to be the winning outcome when you roll the dice:

Evens Odds

Thank you. Please remove this page from the Participant Material Packet, fold it in half (with the blank side facing out) and pass it to the Experimenter.

✂ When you are finished, please remove this page, fold it in half, and pass it to the Experimenter.

Exit Survey

1. Please try and recall how many apps you currently have installed on your smartphone:

   _____ Apps

2. To what extent did today's experiment cause you to feel each of the following emotions?

	Not at All 0	1	2	3	4	Very Strongly 5
Happy	◯	◯	◯	◯	◯	◯
Angry	◯	◯	◯	◯	◯	◯
Excited	◯	◯	◯	◯	◯	◯
Sad	◯	◯	◯	◯	◯	◯
Anxious	◯	◯	◯	◯	◯	◯
Peaceful	◯	◯	◯	◯	◯	◯

3. If you had to guess, what would you say that the purpose of this study was?

   _____

   _____

   _____

   _____

Thank you! Please wait for one moment to allow all other participants to finish, and for the Experimenter to collect your packet.

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

APPENDIX B

ORIGINAL LAMMERS AND STAPEL (2009) MEASURE OF MORAL ORIENTATION

Moral dilemma vignette:

"A high school girl called Carol has promised to help her girlfriend Corinne with a personal problem, when she is asked by Tina, a new girl in her class, to go to the theater with her, at the same time. Carol then has to decide between being loyal to her old friend and being nice to a new girl."

Outcomes:

- Reject Tina's offer: "Carol decided to reject Tina's offer and kept her promise to Corinne."
    - "Suppose you would advise Carol to reject Tina's offer to visit the theater and keep her promise to visit her friend Corinne, what would in that case be the best argument?"
        - 1 = *Corinne needs someone to help her with her problems* (outcome-based)
        - 9 = *A promise is a debt* (rule-based)
- Accept Tina's offer: "Carol rescheduled her appointment with Corinne to visit the theater with Tina."
    - "Suppose you would advise Carol to accept Tina's invitation to the theater and reschedule her appointment with Corinne, what would in that case be the best argument?"
        - 1 = *Tina needs new friends on her new school, because else she will feel lonely.* (outcome-based)
        - 9 = *It is generally a good rule to welcome in and be friendly to new people* (rule-based)

APPENDIX C

EXPERIMENTER'S SCRIPT USED FOR RISK TAKING IN STUDY 1

Experimenter: *"As you know from the Sona-System, in addition to the two experimental credits that you are earning for your participation today, you are also being compensated monetarily. We offered this additional compensation to increase sign-ups for the experiment. We can't afford to pay each participant a lot, so what we decided to do was to offer $3.00, but then also give participants the chance to participate in a 'Double or Nothing' game for the chance to double your compensation. So, you could earn up to $6.00 for your participation today instead of $3.00. However, if you wager all $3.00 and lose the 'Double or Nothing' game, you'll lose the $3.00 and will only earn experimental credits, no money, for your participation.*

In just a moment, you'll indicate whether or not you want to participate in the 'Double or Nothing' game by circling 'yes' or 'no' on the page in front of you. If you choose not to participate, you will receive $3.00, at the end of the session for your participation.

If you choose to participate, you will indicate how much of your compensation you would like to wager. That portion can be anywhere from twenty-five cents to the full $3.00. You must also circle 'odds' or 'evens' on the page in front of you to indicate the winning outcome of the 'Double or Nothing' game. At the end of the session, you'll roll a fair, six-sided dice. Depending on your roll and the winning outcome you selected you'll either win or lose. For instance, if you circle odds, and roll an odd number (1, 3, or 5) you will win. However, if you circle odds and roll an even number (2, 4, or 6) you will lose. Then, depending on the amount that you wagered, and whether you won or lost, your compensation will be calculated.

For your convenience, a table has been provided at the bottom of the page showing the total compensation associated with each wager amount for either a winning or losing outcome. This will help clarify how much you will be compensated depending on A) the amount that you wager, and B) whether or not you win or lose the dice roll.

Does anyone have any questions about the 'Double or Nothing' game?"

[Experimenter pauses for questions and clarifies as needed.]

Experimenter: *"Okay, first, please write your name at the top of the page titled 'Double or Nothing Game.' Next, please indicate whether you want to participate in the 'Double or Nothing' game for a chance to double your compensation, or not participate and receive $3.00. Circle 'yes' or 'no'. If you choose not to participate, stop, and do not complete questions two and three. If you choose to participate, continue on to questions to and three to indicate how much you would like to wager, and to select either 'odds' or 'evens' as the winning outcome. When you've made all of your selections, remove this page from the rest of the packet, fold it in half with the blank side facing out, and pass it to me.*

When you've done so, you can complete the next page of the participant material packet and wait until I provide additional instructions." [Experimenter collects completed and folded "Double or Nothing" Game Entry Forms]

APPENDIX D

EMAIL TEXT USED FOR PARTICIPANT DEBRIEFING IN STUDY 1.

"Dear Participant,

You are receiving this email today because you participated in a study entitled 'A Study of College Students' Smartphone Use / A Study of Decision Making' during the Spring 2016 semester at Loyola University Chicago. This email is intended to provide you with more information about hat study now that data collection has been completed. During the study you were asked either to keep or give to the experimenter either your smartphone or your student ID depending on your condition. The purpose of the study was to better understand how access to one's smartphone influenced an individual's behavior. Previous research has found that access to an individual's smartphone increased his or her psychological power (Egan & Larson, 2015). The study in which you participated was intended to replicate that study and to see whether smartphone-induced power influenced risk-taking and moral orientation. The Double-or-Nothing Game, wherein you decided whether or not to wager some of your compensation, served as the measure of risk-taking. The Social Decision-Making Task wherein you made a choice about a girl named Carol faced with a dilemma involving an old friend and a new acquaintance served as the dependent measure of moral orientation. Previous research has found that high-power individuals take more risks (Carney, Cuddy, & Yap, 2010) and show a relative preference for rule-based decision making (Lammers & Stapel, 2009). The prediction of the study in which you predicted was that participants who were allowed access to their smartphone would 1) take more risks, and 2) show a relative preference for rule-based arguments for Carol's decision.

I'd like to thank you again for your participation. The results of this study will make an important contribution to the fields of psychological power, human-computer interactions, and moral decision making and behavior. If you are interested in learning more about these fields, some references to related articles have been provided below. If you have further questions regarding this study, please direct all communication to the primary experimenter, Amanda Egan (adye4@luc.ed).

References:

- Carney, D. R., Cuddy, A. J., & Yap, A. J. (2010). Power posing brief nonverbal displays affect neuroendocrine levels and risk tolerance. *Psychological Science, 21*(10), 1363-1368.
- Egan, A. C. & Larson, J. R. (2015). *The empowering effect of smartphones: The influence of smartphones on psychological power and self-efficacy.* Manuscript in preparation. 11
- Keltner, D., Gruenfeld, D. H., & Anderson, C. (2003). Power, approach, and inhibition. *Psychological review, 110*(2), 265.
- Lammers, J., & Stapel, D. A. (2009). How power influences moral thinking. *Journal of personality and social psychology, 97*(2), 279.

Thank you,

Amanda Egan
Doctoral Candidate
Applied Social Psychology
Loyola University Chicago
Adye4@luc.edu"

APPENDIX E

MATERIALS/APPARATUS USED IN STUDY 2

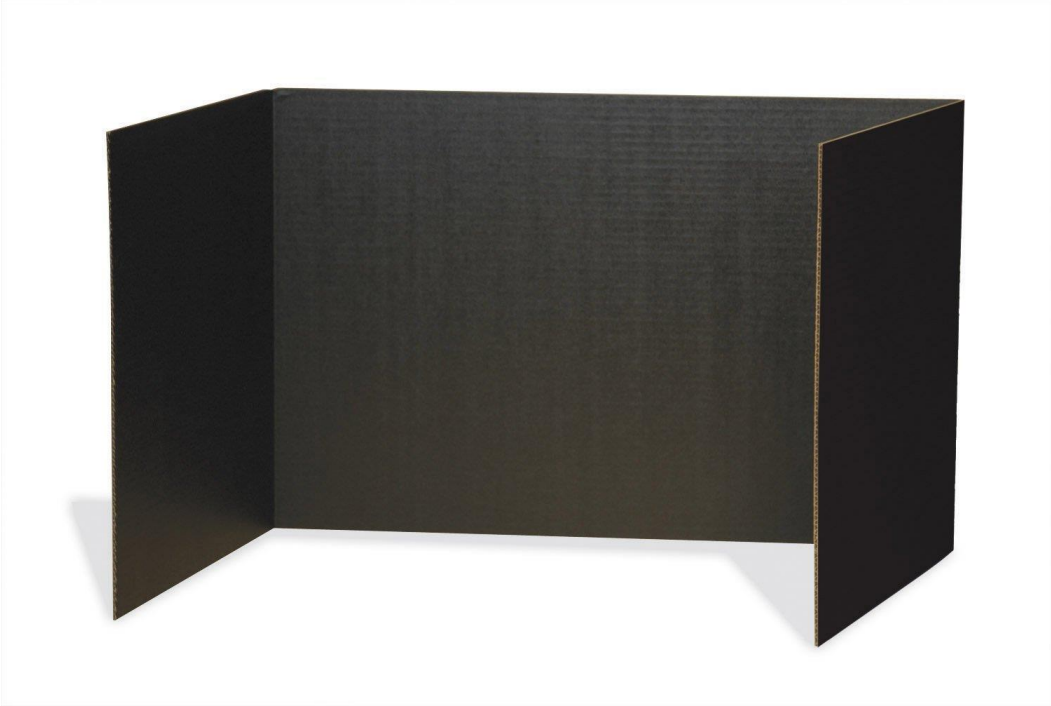

Image 1. Black privacy board measuring 48” long by 16” tall. These were used to divide larger tables into individual workspaces providing the participants with privacy. Image from amazon.com where privacy boards were purchased.

Image 2. Black and white ten-sided dice. Images from amazon.com where die were purchased.

APPENDIX F

DATA COLLECTION MATERIAL PACKET USED IN STUDY 2.

The next 10 pages are the paper-and-pencil participant material packet used in Study 2. The version included is the smartphone deprivation condition.

Loyola University Chicago

STUDY OF COLLEGE STUDENTS' SMARTPHONE USE

Experiment: 2773

Spring, 2016

Part 1: Instructions

You will be asked to complete a series of questionnaires. At the bottom of each page will be instructions indicating whether or not to stop and wait for further instruction before proceeding, or whether to proceed to the next page. Please look for these instructions at the bottom of each page and follow them carefully.

Also, as a part of your compensation for participating today, in addition to the two experimental credits you will earn, you will be given the opportunity to enter a raffle for a chance to win one of two $150.00 Amazon gift cards. Later during the experiment, you will use the provided dice and calculator to determine how many raffle entries you will receive.

Please wait. The Experimenter will instruct you when it is time to turn the page. Thank you!

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

Smartphone User Attitudes Scale

Please indicate how true each of these statements is for you. Place a mark inside one circle per row indicating the choice that is most applicable.

	1 = Definitely Not True	2	3	4	5	6 = Definitely True
I have a lot of personal information stored on my smartphone.	◯	◯	◯	◯	◯	◯
My smartphone reflects my personality.	◯	◯	◯	◯	◯	◯
My smartphone makes me feel connected to home wherever I am.	◯	◯	◯	◯	◯	◯
I feel like I've gotten to "know" my smartphone like one does a friend.	◯	◯	◯	◯	◯	◯
Other people often use my smartphone.	◯	◯	◯	◯	◯	◯
I spend a lot of time using my smartphone.	◯	◯	◯	◯	◯	◯
I am very possessive of my smartphone.	◯	◯	◯	◯	◯	◯
I always have my smartphone with me.	◯	◯	◯	◯	◯	◯
I would be willing to let a friend borrow my smartphone for the day.	◯	◯	◯	◯	◯	◯
My smartphone is extremely useful in helping me achieve my goals.	◯	◯	◯	◯	◯	◯
I know how to use all of the features of my smartphone.	◯	◯	◯	◯	◯	◯
I have taken a lot of time to personalize my smartphone.	◯	◯	◯	◯	◯	◯
My smartphone makes me feel more capable.	◯	◯	◯	◯	◯	◯
I am very familiar with my smartphone.	◯	◯	◯	◯	◯	◯
My smartphone is an extension of myself.	◯	◯	◯	◯	◯	◯
I would feel lost without my smartphone.	◯	◯	◯	◯	◯	◯
My smartphone is a kind of "home-away-from-home."	◯	◯	◯	◯	◯	◯
I am able to accomplish a lot more as a result of having my smartphone.	◯	◯	◯	◯	◯	◯

➔ **PROCEED.** Go ahead and proceed to the next page. Thank you!

Smartphone Use Questionnaire

We are interested in learning more about how college students user their smartphones. Please provide some information about your smartphone and how you use it.

9. To what extent do you rely on your phone for each of the following? Indicate your choice by placing a mark in one circle per row.

	0 = Not at All	**1**	**2**	**3**	**4**	**5 = To a Great Extent**
Accessing the Web	◯	◯	◯	◯	◯	◯
Sending/Receiving Emails	◯	◯	◯	◯	◯	◯
Social Media	◯	◯	◯	◯	◯	◯
Making/Receiving Phone Calls	◯	◯	◯	◯	◯	◯
Listening to Music	◯	◯	◯	◯	◯	◯
Sending/Receiving Text Messages	◯	◯	◯	◯	◯	◯
Maps/Location Services	◯	◯	◯	◯	◯	◯
Shopping	◯	◯	◯	◯	◯	◯
Playing Games	◯	◯	◯	◯	◯	◯
Calendar/Reminders	◯	◯	◯	◯	◯	◯
Watching Videos	◯	◯	◯	◯	◯	◯
Taking Photos/Videos	◯	◯	◯	◯	◯	◯
Other Applications (Finance Apps, Fitness Apps, etc.)	◯	◯	◯	◯	◯	◯

10. What make (iPhone, Android, etc.) and model (5s, Galaxy s5, Droid Turbo, etc.) of smartphone do you have? _____

11. At what age did you first get a smartphone? _____ years old.

➔ **PROCEED.** Go ahead and proceed to the next page. Thank you!

12. How many months have you owned your current smartphone? _____ months. On a scale of 1 to 10, 1 being that your phone does not work at all and 10 being that your phone works perfectly, how well does your current phone function?

1 = Not At All	2	3	4	5	6	7	8	9	10 = Perfectly
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

13. On a scale of 1 to 10, 1 being completely dissatisfied and 10 being completely satisfied, how satisfied are you with your current phone?

1 = Completely Dissatisfied	2	3	4	5	6	7	8	9	10 = Completely Satisfied
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

14. What is your biological sex?

◯ Female

◯ Male

◯ Other / Prefer Not to Reply

15. What is your age? _____

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

Part 2: Instructions

Before we continue, please be sure to silence your mobile phone, and place it in the clear container provided by the experimenter. Later in the experiment, you will be asked for some information which you may be tempted to obtain from your mobile phone. For this reason, we are asking you to place your phone in the clear container on the table at the front of the room where you will not be able to access it.

Once you have completed this step, please wait until the experimenter instructs you to proceed.

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

BIS/BAS

Please indicate how much you agree with each of the following statements. Place a mark inside one circle per row indicating the choice that is most applicable.

	1 = Strongly Disagree	2	3	4 = Strongly Agree
When I go after something, I use a "no holds barred" approach.	○	○	○	○
I worry about making mistakes.	○	○	○	○
When good things happen to me, it affects me strongly.	○	○	○	○
When I'm doing well at something, I love to keep at it.	○	○	○	○
When I see an opportunity for something I like, I get excited right away.	○	○	○	○
I'm always willing to try something new if I think it will be fun.	○	○	○	○
I have very few fears compared to my friends.	○	○	○	○
I feel worried when I think I have done poorly at something.	○	○	○	○
I go out of my way to get things I want.	○	○	○	○
When I want something, I usually go all-out to get it.	○	○	○	○
I feel pretty worried or upset when I think or know somebody is angry at me.	○	○	○	○
If I see a chance to get something I want, I move on it right away.	○	○	○	○
Even if something bad is about to happen to me, I rarely experience fear or nervousness.	○	○	○	○
When I get something I want, I feel excited and energized.	○	○	○	○
I often act on the spur of the moment.	○	○	○	○
Criticism or scolding hurt me quite a bit.	○	○	○	○
It would excite me to win a contest.	○	○	○	○
I crave excitement and new sensations.	○	○	○	○
If I think something unpleasant is going to happen, I usually get pretty "worked up."	○	○	○	○
I will often do things for no other reason than they might be fun.	○	○	○	○

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

Raffle Entry Game

In addition to the experimental credits that you are receiving for your participation, we are offering two $150.00 Amazon gift cards. To determine how many raffle entries you will receive for your participation, you will roll the two 10-sided dice that you have been given. Each die is numbered from 0 to 9. First, you will roll the white die and record the number rolled in the box on the right. That number will become the ones digit for the number of raffle entries you earned. Second, you will roll the black die and record the number rolled in the box on the left. That number will become the tens digit for the number of raffle entries you earned. Depending on the number you roll, you may earn anywhere from zero to 99 raffle entries. If you prefer not to enter the raffle, please select the appropriate box below.

_____ _____

Tens Ones

If you prefer not to enter the raffle, please check this box: ☐

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

Exit Survey

1. Please try and recall how many apps you currently have installed on your smartphone:

   _____ Apps

2. Data collection sessions are run in various rooms. To assess the suitability of different rooms for data collection, please provide some feedback regarding the room that you completed your experiment in today by indicating how strongly you agree with each of the statements below.

	1 = Strongly Disagree	2	3	4 = Strongly Agree
The room was well-lit for the experiment.	◯	◯	◯	◯
I experienced a lot of distractions during the experiment.	◯	◯	◯	◯
I had complete privacy during the experiment.	◯	◯	◯	◯
The room was quiet for the experiment.	◯	◯	◯	◯

3. To what extent did today's experiment cause you to feel each of the following emotions?

	Not at All 0	1	2	3	4	Very Strongly 5
Happy	◯	◯	◯	◯	◯	◯
Angry	◯	◯	◯	◯	◯	◯
Excited	◯	◯	◯	◯	◯	◯
Sad	◯	◯	◯	◯	◯	◯
Anxious	◯	◯	◯	◯	◯	◯
Peaceful	◯	◯	◯	◯	◯	◯

➲ **PROCEED.** Go ahead and proceed to the next page. Thank you!

4. If you had to guess, what would you say that the purpose of this study was?

_____

_____

_____

_____

_____

Thank you! Please wait for one moment to allow all other participants to finish, and for the Experimenter to collect your packet.

STOP! Please wait for experimenter instructions before proceeding to the next page. Thank you!

APPENDIX G

EMAIL TEXT USED FOR PARTIAL PARTICIPANT DEBRIEFING IN STUDY 2.

"Dear Participant,

You are receiving this email today because you participated in a study entitled 'A Study of College Students' Smartphone Use / A Study of Decision Making' during the Spring 2016 semester at Loyola University Chicago. This email is intended to provide you with more information about hat study now that data collection has been completed. During the study you were asked either to keep or give to the experimenter either your smartphone or your student ID depending on your condition. The purpose of the study was to better understand how access to one's smartphone influenced an individual's behavior. Previous research has found that access to an individual's smartphone increased his or her psychological power (Egan & Larson, 2015). The study in which you participated was intended to replicate that study

I'd like to thank you again for your participation. The results of this study will make an important contribution to the fields of psychological power, and human-computer interactions. If you are interested in learning more about these fields, some references to related articles have been provided below. If you have further questions regarding this study, please direct all communication to the primary experimenter, Amanda Egan (adye4@luc.ed).

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Thank you,
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VITA

Amanda Egan was born and raised in Columbus, Ohio. Before attending Loyola University Chicago, she attended Cedarville University, in Cedarville, Ohio where she earned her Bachelor of Arts in Psychology, in 2005. She completed her Master of Arts in Social Psychology at Loyola University Chicago, in 2014.

While at Loyola, Egan worked with Dr. James R. Larson Jr. in his lab studying groups and individuals working in teams. Her own research included work on the effects of semantic clustering in group ideation, the capacity of persuasive technology to influence moral behaviors, and the impact of smartphone custody on self-efficacy and psychological power.

While at Loyola, she also worked with Dr. Arthur Lurigio on a project investigating the effectiveness of mental health courts. She served as a graduate research assistant for the Graduate School at Loyola University where she assisted with research on a project studying financial literacy among graduate students as well as a program evaluation of Loyola's humanities graduate programs.

In addition to her research endeavors, Egan taught laboratory in social psychology, research methods, and general psychology. She has also trained and managed a number of undergraduate research assistants and provided oversight and mentorship for undergraduate research projects.

DISSERTATION APPROVAL SHEET

The dissertation submitted by Amanda C. Egan has been read and approved by the following committee:

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The final copies have been examined by the director of the dissertation and the signature that appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval by the committee with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

_____ _____

Date Director's Signature